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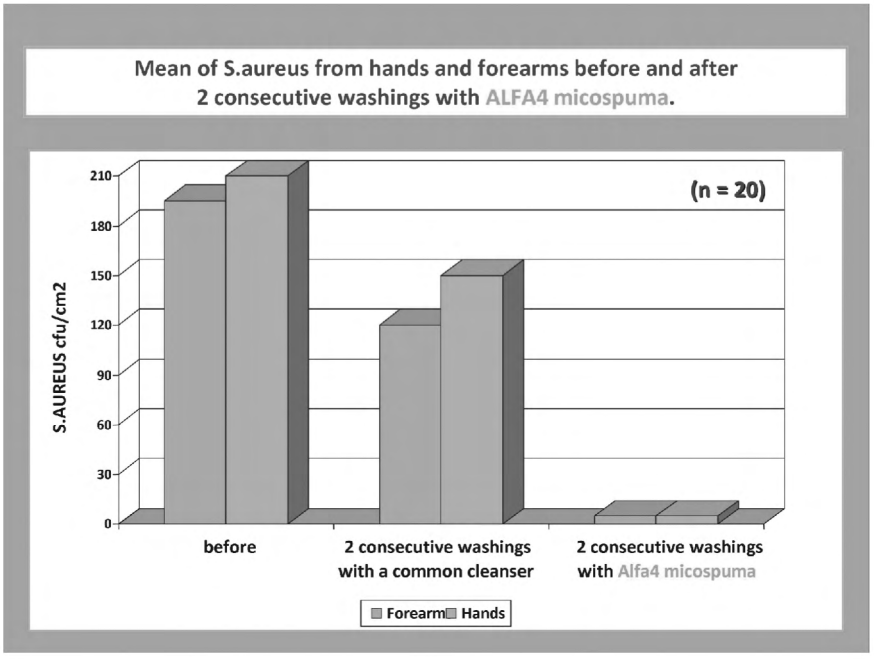

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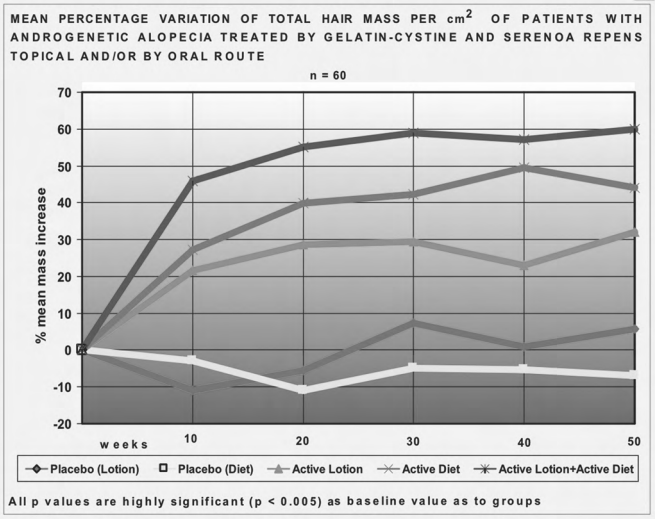

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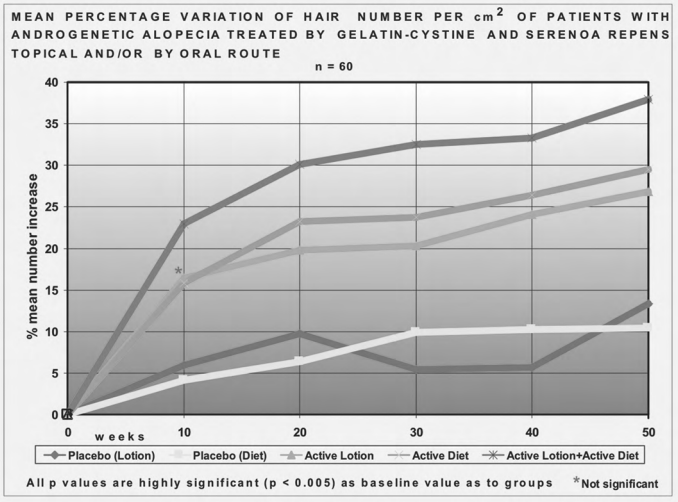

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3

Trimestrale di Dermatologia Cosmetologica
Quarterly Review of Cosmetic Dermatology

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We wish to dedicate this issue of the Journal of Applied Cosmetology to the memory of a well known dermatologist: professor Lucio Andreassi

A well-known scientist, and important fellow of our Society, Professor Lucio Andreassi, left us "in punta di piedi"(on tiptoe), according to his mite and delicate behaviour.
It is for me a great honor to write these few words to remember a man who devoted his life to the profession without forgetting his family, the numerous friends and colleagues in every part of the world.

Professor and Head Department of the Clinical Dermatology of the University of Siena, Italy, Lucio Andreassi has been also Dean of the Medical Faculty, has participated to many worldwide meetings, and written a relevant number of scientific papers and book chapters printed on national and international journals.
In particular, I'd like to remember his participation as President at the 7th International Congress of ISCD, The New Frontiers of Dermo-Cosmetology, held in Rome into the historical location of S. Spirito Hospital. On that occasion, he opened the meeting with an interesting lecture based on the relationship between beauty and psychophysical well-being underlining that "cosmetics take on the connotation of true skin drugs that provide charm and beauty, thus improving self-perception of the body and producing health and well-being,...ameliorating the quality of life".
With this lecture, Lucio Andreassi highlighted the importance of using cosmetics as supporters and health agents of many dermatological therapies, as the main scope of our Society. This topic was further underlined during the introductory remarks held into the beautiful House of Italian Parliament, Sala del Cenacolo e Sagrestia, as reported by the following photo:

Lucio Andreassi apart from being ISCD board member and fellow, was a great friend, always open to give suggestions and ideas for the scientific programmes of both the Society and the Journal of Applied Cosmetology.
His wide culture, versatile personality, and class remain an unforgettable memory for all of us.

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Trimestrale di Dermatologia Cosmetologica
Quarterly Review of Cosmetic Dermatology

Contents

Gentili Lettori,

da 32 anni il Journal of Applied Cosmetology, organo ufficiale dell'International Society of Cosmetic Dermatology (I.S.C.D.), viene stampato su carta ecologica chlorine free" e distribuito via posta a livello internazionale.

Il Comitato Editoriale informa che dal 2015, in linea con gli standard internazionali, la rivista sarà pubblicata solamente in forma digitale online.

La decisione è stata presa per essere vicini alla bioeconomia che prevede minor consumo di energia e di acqua che, come è noto, servono anche per produrre la carta, e limitare i gas inquinanti emessi dai trasporti.

Fiduciosi che questa decisione, oltre ad essere condivisa dai Soci dell'I.S.C.D., sia apprezzata dai numerosi lettori, Vi auguro buona lettura.

L'Editore
Pierfrancesco Morganti

Dear Readers,

for 32 year the Journal of Applied Cosmetology, official organ of the International Society of Cosmetic Dermatology (I.S.C.D.), has been printed on ecological paper "chlorine free", and internationally shipped.

The Editorial Board informs that from 2015, according to the International Environmental Standard, the journal will be published in digital version online only.

This decision has been taken in order to contribute to the development of the Bio-economy, which invites to reduce the consumption of energy and water, in our case used to print on paper, as well as to reduce gas emission also generated by transport.

We believe that, apart from the I.S.C.D. Members, this decision will be appreciated by all the readers.

The Editor-in-Chief
Pierfrancesco Morganti

J. Appl. Cosmetol. **32,** 105-115 (July/December 2014)

Treatment of Hair Thinning and Hair Ageing with Specific Lectican and Leucine Proteoglycans. A review

E. Thom[1], J. Wadstein[1], E. W. Thom[1], D. H. Kingsley[2]

[1] ETC Research and Development; Oslo, Norway.

[2] British Science Corporation; Staten Island, NY 10314, USA.

Received: *November, 2014*

Key words: *Hair follicles; Hair regulation; Anagen prolongation; Proteoglycans; Glycosaminoglycans;*

Summary

Research evidence accumulated during the last 20 years on the function and cycling of the hair follicle has demonstrated that certain specific proteoglycans play a central role. Specifically versican and decorin are integral components in this connection.

Various extrinsic and/or intrinsic factors can disturb the delicate balance of specific proteoglycans in the follicle. It is documented that age and stress, among others, can disrupt this balance, and in turn, normal hair follicle function. A decline in structural components, such as several keratins or a shift of apoptotic parameters is often seen in this connection.

Supplementation with bioactive substances can counteract the extrinsic or intrinsic factors and lead to normal hair follicle function. Per-oral OTC supplements containing specific proteoglycans, a fractionated fish extract with specific lectican and leucine proteoglycans**, provide the body and the hair follicles with the crucial and specific bioavailable components needed for normal functioning.

With the results from earlier scientific research on the importance of specific versican and decorin, combined with results from clinical studies using marine extract*** demonstrating significant reduction of hair loss and improvement in re-growth, important deductions can be made.

There is a well-founded scientific basis for recommending proteoglycan replacement therapy as baseline treatment* with subjects suffering from hair loss problems and/or hair growth disorders, as it has been shown that proteoglycan levels decline within the hair follicle both with age and whilst experiencing stress.

In conclusion, supplementation containing marine extract*** can revitalise dysfunctional follicles and open a new era on nutritional factors influencing hair loss and/or hair growth.

In addition to the positive effect on hair growth, it is hypothesised that there may be a positive effect with the use of supplementation containing marine extract*** on hair greying. Theoretically, this is possible, and clinical work we have conducted supports this theory.

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Riassunto

Evidenze sperimentali degli ultimi 20 anni eseguite sul controllo del ciclo di vita dei capelli, hanno posto in evidenza come alcuni proteoglicani, primi fra tutti versican e decorin, giochino un ruolo centrale su tale ciclo. Diversi fattori, quali l'età e lo stress, possono alterare l'equilibrio del ciclo dei capelli, legato anche alle modifiche strutturali delle cheratine o alla vita stessa delle cellule. L'integrazione con sostanze bioattive potrebbero interagire con sia con fattori estrinseci che intrinseci, compensando eventuali squilibri. A tal riguardo l'integrazione orale con particolari proteoglicani contenuti in un estratto di pesce ricco di lectican e leucina, sembra essere utile per arricchire il follicolo pilifero di specifici componenti necessari alla funzione del suo ciclo. Dai risultati ottenuti con precedenti studi che hanno evidenziato l'importanza clinica dei proteoglicani versican e decorin, e dall'efficacia clinica evidenziata dall'uso di particolari estratti marini, sembra possibile dedurre come questi particolari composti possano essere utili ad ottimizzare la ricrescita dei capelli. Vi sono perciò fondate ragioni scientifiche per ritenere come la terapia a base di proteoglicani possa risultare utile per pazienti soggetti ad anomala perdita di capelli o comunque affetti da problemi che ne rallentano la ricrescita, a causa dell'età o di frequenti stress.

In conclusione, l'integrazione alimentare con prodotti contenenti specifici estratti marini, sembra poter essere utile per riequilibrare disfunzioni legate alla vita del follicolo pilifero aprendo nuove strade per curare la ricrescita dei capelli. Inoltre, sembrerebbe anche possibile che l'uso di questi integratori possa modulare anche l'ingrigimento. Il nostro gruppo di lavoro sta conducendo nuovi studi per supportare questa ipotesi.

INTRODUCTION

For the majority of people, the appearance of hair plays an important role in overall physical appearance, confidence, and self-perception, and in modern society the desire to look youthful plays a larger role than ever. The hair care industry is acutely aware of this and so has become more capable of delivering active products that are directed toward meeting this consumer demand (1-4).

The discovery of pharmacological targets and the development of safe and effective drugs also indicate strategies of the drug industry for maintenance of healthy and beautiful hair.

Hair ageing is characterised by weathering of the hair shaft and ageing of the hair follicles. Hair follicle ageing presents as a manifestation of a decrease in melanocyte function resulting in hair greying, as well as a decrease in hair production in the form of Androgenetic and Senescent Alopecia. The scalp is also subject to intrinsic or physiological ageing and extrinsic ageing caused by external factors. Intrinsic factors are related to individual genetic and epigenetic mechanisms with individual variations, with common phenotypes including premature greying and Androgenetic Alopecia. Extrinsic factors include ultraviolet radiation and smoking, among others, and experimental evidence supports the hypothesis that oxidative stress plays a role in skin and hair ageing as well.

Topical anti-ageing compounds for hair include humefactants, hair conditioners, photoprotectors, and antioxidants. Current available treatment modalities with proven efficacy for treatment of hair loss are topical minoxidil (5), oral finasteride (6), cyproterone acetate (7, 8), spironolactone (9), progesterone (10), autologous hair transplantation (11), laser light therapy (12, 13), and a few natural products (1, 2, 24). In the absence of other ways to reverse hair greying, hair colourants are the mainstay of recovering lost hair colour. Topical liposome targeting for melanins, genes, and proteins selectively to hair follicles are under current investigation (14, 15).

A hair growth cycle treatment product has been developed** by Pharma Medico Group. The main ingredient is an exclusive extract of marine origin*** and is a proprietary fractionated fish extract, containing specific lectican and leucine proteoglycans, specific glycosaminoglycans, proteins, and minerals with small amounts of carbohydrates and lipids. In addition the product contains vitamins and minerals.

The product is available as an OTC food supplement for treatment of hair loss problems and/or hair growth disorders, and is the leading product in this category of the market in, among others, the United Kingdom.

Crude marine extracts, since the early 1990s, have been used in some food supplements for treatment of ageing skin as well as for the treatment of arthritis; in both cases with some success. The medical community is still skeptical of the clinical effects of crude marine extracts, especially in the arthritis field, yet a large number of patients are using marine extract-based preparations in combination with conventional drug therapies with positive results (16-22).

In the treatment of ageing hair, beginning with hair loss, several well-designed studies have been carried out with food supplements in which marine extracts are the main ingredients. Two studies have been carried out as CRT (Controlled Randomised Trials) (23-24) of which one used the proprietary fractionated fish extract with specific lectican and leucine proteoglycans*** (24), as well as another study carried out with open methodology (25). Furthermore, an in-clinic,

* *Trade name: Nourkrin® with Marilex® from Pharma Medico*
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*** *Trade name: Marilex®*

medically monitored study was carried out with the product* (1). The experiences from most of these studies are impressive, and show a significant and positive effect on hair growth. Daily dosing also demonstrated that tolerability has been excellent.

In the two CRT studies, the main bulk of the participants were men with Androgenetic Alopecia, also referred to as Male Pattern Hair Loss (MPHL) or common baldness. However, in the in-clinic medically monitored study, a complete female population was used, leading to no gender difference in the efficacy of the fractionated fish extract with specific lectican and leucine proteoglycans reported. In some of the open studies, a female population was also included and no gender differences in the efficacy of the marine extracts were reported. No CRT designed studies have been carried out in relation to Androgenetic Alopecia in females, also known as Female Pattern Hair Loss (FPHL).

HAIR LOSS IN MALES AND FEMALES

Androgenetic Alopecia (AGA) affects at least 50% of men by the age of 50, and up to 70% of all males later in life (26). Estimates of its prevalence in women have varied widely, though recent studies claim that at least 16% of women aged less than 50 years are affected, increasing to a proportion of 30-40% of women aged 70 years and over (27).

The hair loss is heritable, androgen dependent, and occurs in a defined pattern. It is assumed that the genetically predisposed hair follicles are the target for androgen-stimulated hair follicle miniaturisation, leading to gradual replacement of large, pigmented hairs (terminal hairs) by barely visible depigmented hairs (vellus hairs) in affected areas (28). The result is a progressive decline in visible scalp hair density. Whilst male pattern AGA is characterised by the typical bitemporal recession of hair and a balding vertex (26), FPHL is set apart by the diffuse thinning of the crown and intact frontal hairline (29).

While the genetic involvement is pronounced, but poorly understood, major advances have been achieved in understanding principal elements of the androgen metabolism involved in the pathogenesis of AGA (30). Androgen-dependent processes are predominantly due to the binding of dihydrotestosterone (DHT) to the androgen receptor (AR). Dihydrotestosterone-dependent cell functions depend on the availability of weak androgens, their conversion to more potent androgens via the action of 5α-reductase, low enzymatic activity of androgen inactivating enzymes, and functionally active AR present in high numbers. The predisposed scalp exhibits high levels of DHT, and increased expression of the AR. Conversion of testosterone to DHT within the dermal papilla plays a central role, while androgen-regulated factors deriving from dermal papilla cells are believed to influence growth of other components of the hair follicle. Since many extrinsic hair growth-modulatory factors, such as androgens (31), apparently operate, at least in part, via the dermal papilla, research is currently also focused on identifying androgen-regulated factors deriving from dermal papilla cells. Of the several factors that have been suggested to play a role in hair growth, so far only insulin-like growth factor (IGF-1) has been reported as altered in-vitro by androgens (32). Stem cell factor (SCF) has been found to be produced in higher amounts by androgen-dependent beard cells than in control non-balding scalp cells, presumably also in response to androgens (33). Since SCF is the ligand for the

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cell surface receptor c-kit on melanocytes, this may also play a role for hair pigmentation.

Finally, the relationship of FPHL to (male pattern) AGA has been challenged. Arguments against FPHL representing the female counterpart of male AGA are: a probable mother-to-daughter transmission of FPHL, a significantly lower incidence of FPHL in women than AGA in men (27), occurrence of FPHL in the absence of circulating androgens (34), lack of response to antiandrogen therapy in normoandrogenetic premenopausal women (35), lack of response to 1 mg oral finasteride daily in postmenopausal women (36), and occurrence of male pattern AGA in women with pathologically elevated androgen levels. It has been suggested that the different pattern of hair loss in the majority of women from that usually seen in men may be due to differences in the relative levels of 5α-reductase, aromatase, and androgen receptors in scalp hair follicles in women compared with those in men (37).

PROTEOGLYCANS AND THE HAIR FOLLICLE

To guarantee the growth of strong and healthy hair, various specialised cell types in the follicle interact in a complex set of molecular signals. Biological alterations due to intrinsic and extrinsic stimuli can destabilise this well-balanced hair growth metabolism (15).

In addition, ageing and lack of oxygen and nutrients could also be characterised as a disturbance in this perfectly organised system, slowly leading to follicle miniaturisation and death. During the period 1991 to 2008 a number of basic research studies have been published showing the presence and importance of proteoglycans (PGs) and glycosaminoglycans (GAGs) on the cycling and proper functioning of the human hair follicle (38-44).

A proteoglycan is comprised of a core protein which has one or more covalently attached glycosaminoglycan (GAG) side chains. GAGs are long, unbranched polysaccharides containing a repeating disaccharide unit (45). One of the biologically active proteoglycans in the proprietary fractionated fish extract *** is a versican.

Versican, a chondroitin sulphate proteoglycan, is one of the main components of the extracellular matrix, which provides a loose and hydrated matrix during key events in development and disease. Versican has an apparent molecular mass of more than 1000kDa, and in 1989, Zimmermann and Ruoslahti cloned and sequenced the core protein of fibroblast chondroitin sulphate proteoglycan. It was designated 'versican' in relation to its versatile modular structure. Versican belongs to the lectican protein family, and is also known as chondroitin sulphate proteoglycan core protein 2 or chondroitin sulphate proteoglycan 2 (CSPG2), and PG-M (50).

Versican participates in cell adhesion, proliferation, migration, and angiogenesis, and hence plays a central role in tissue morphogenesis and maintenance. In addition, versican contributes to the development of a number of pathologic processes including atherosclerotic vascular diseases, cancer, tendon remodeling, hair follicle cycling, central nervous system injury, and neurite outgrowth (50). Versican is a complex molecule consisting of modular core protein domains and glycosaminoglycan side chains, and there are various steps of synthesis and processes regulating them. Also, there are differential, temporal, and spatial expressions of versican by multiple cell types and in different developmental and pathological time frames. To fully appreciate the functional roles of versican as it relates

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to changing patterns of expression in development and disease beyond hair follicle cycling, and thereby the scope of this review paper, an in-depth knowledge of versican's biosynthetic processing is necessary (46, 47).

Decorin is a prototypical member of the small leucine-rich proteoglycan gene family, which consists of a glycosaminoglycan and protein core with 12 leucine-rich repeats. Quite recently it has been documented that the small decorin plays a pivotal role in hair biology. The research results suggest that decorin may modulate follicular cycling and morphogenesis and act as an anagen inducer (48, 49). It has previously been shown that the structure of decorin undergoes age-dependent alteration, which may contribute to skin fragility in elderly people (50). The product* contains lectican as well as leucine-rich proteoglycans.

The predominant symptom of hair ageing, greying, is addressed in a plurality of research activities, as age-related changes beyond loss of pigmentation remain obscure. It has been reported that hair follicle density, growth rate, and hair diameter all decline with age, but the molecular events underlying the macroscopic alterations are still poorly understood. It has, however, been shown that concordantly to other biological systems, the hair follicle undergoes an ageing process associated amongst others with a decline in structural proteins such as several keratins, or a shift of apoptotic parameters (14, 15).

In order to get marine extract distributed in the body, one has to be able to demonstrate that it is bioavailable. Volpi has published two clinical studies showing that proteoglycans are absorbed and distributed in the body after oral intake (51, 52).

To guarantee the growth of strong and healthy hair, various specialised cell types in the hair follicle interact according to a complex set of molecular signals. Biological alterations due to intrinsic and extrinsic stimuli can destabilise this well-balanced system, thus affecting hair growth or metabolism. Also, ageing could be characterised as a disturbance in this perfectly organised system (53, 54).

Intake of the specific proteoglycans* is a replacement therapy that will improve the function and cycling of the hair follicle. It has been shown that versican also protects the cells from oxidative stress-induced apoptosis (55). This might have an effect on the oxidative stress taking place in the hair follicle which is mainly due to Hydrogen Peroxide (H2O2). Senile greying of human hair has been subject to intense research since ancient times.

Reactive oxygen has been implicated in hair follicle melanocyte apoptosis and DNA damage.

It has been shown by FT-Raman spectroscopy in vivo quite recently that human grey hair/white scalp hair shafts accumulate hydrogen peroxide (H2O2) in millimolar concentrations (56). The data from this research feed the long-voiced, but insufficiently proven, concept of H2O2-induced oxidative damage in the entire human hair follicle, inclusive of the hair shaft, as a key element in senile hair greying, which does not exclusively affect follicle melanocytes. This opens new insight for intervention and reversal of hair greying.

Our recent clinical findings demonstrate that the fractionated fish extract with specific lectican and leucine proteoglycans containing versicans and decorin*** can reduce the effects of hair greying, and lends itself to the inherent antioxidative effect of the versicans described above (51). Furthermore, this antioxidative property may play a secondary role in protecting testosterone's oxidation to dihydrotestosterone (DHT).

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CONCLUSION

In conclusion, supplements containing specific bioavailable proteoglycans* can revitalise dysfunctional hair follicles and open a new era on nutritional factors that influence hair loss. As such, it is beneficial using the product* as a continuous, baseline treatment in all types of hair loss, also when targeting age and stress related hair loss cases, both as a prophylactic (preventative measure), and a therapy (treatment).

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The Italian Cosmetic System

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Summary

The Italian cosmetics industry ended 2014 with dynamics sustained by a robust revival in exports, by consumption trends through the pharmacy channel and by above-average growth in the direct sale channels.
The mass distribution channel had a hard time, though it was saved by large specialised retail outlets. Despite uncertainties due to price evolution and tension in the domestic market, the signs for 2015 point to further revival.
Figures show, indeed, that Italian cosmetics is naturally "attentive to the customer", more than many other industries. The alliance with the consumer is, in fact, a key element of the Italian cosmetics' strength and stability.
The evolution dynamics of “new markets”, despite the current economic struggles, confirm the value of this alliance.
In the cosmetics industry endurance prevails over weakening both on the company sides and on the specular consumer one. With regards to the latter, it is recorded that prudent or even withdrawal approaches are broken favouring the will to reconquer their "right to wellbeing" translating the latter in consistent choices of product and channel.

Riassunto

L’industria cosmetica Italiana chiude il 2014 con significative dinamiche, sostenute dalla costante crescita delle esportazioni, da trend di consumo interno positivo per il canale farmacia e la crescita sopra la media delle vendite dirette.
La grande distribuzione organizzata soffre di una generale contrazione, bilanciata dalle vendite nei canali specializzati. Nonostante le incertezze legate all’evoluzione dei prezzi e alle tensioni congiunturali sul mercato interno, i segnali per il 2015 indicano una ulteriore crescita.
I dati peraltro confermano che il comparto cosmetico italiano ha un’attenzione al consumatore superiore a molti altri comparti manifatturieri. L’alleanza col consumatore, infatti, è l’elemento chiave della competitività e della forza dell’industria italiana.

Le dinamiche evolutive dei nuovi canali, nonostante le tensioni macroeconomiche interne, confermano il valore di questa alleanza.
Nel settore cosmetico nazionale la resistenza prevale sull'indebolimento sia per le industrie che per i consumatori. Questi ultimi registrano un approccio reattivo nei confronti della indebolita propensione al consumo, riaffermando il diritto al proprio benessere che si trasforma nelle nuove scelte sia di prodotto che di canale.

INTRODUCTION

Italian cosmetics market over €9,500 million in 2014 Export is booming at +5,5% Consumer habits vary, but they do not give up cosmetics

Italians do not give up cosmetics, a product essential to everyday hygiene and personal wellness. The data demonstrating this showed consumption of over €9,500 million, with a marginal drop of 1.2% for 2014.

The rise in export of 11 percentage points equalling nearly €3,200, supports the production, 9,300 million euros, a 2.6% increase: the major growth of export both in terms of quantity (+17.5%) and value testifies to the broad competition Italian companies have gained.

New tendencies in consumption are appearing. As a confirmation of the significant transformation under way in consumer purchasing habits, direct door to door sales (over €450 million) and herbalist shops (a value equal to €409 million) show positive trends of 4.5% and 2.8% respectively. Even the pharmacy, after a drop in the previous financial years, is on the rise again, up by 0.3% exceeding €1,750 million.

Pressure on the willingness to consume of large brackets of users has conditioned the drop in sales at perfume shops, (-3.8%) equal to over €2,100 million, as well as in the professional channels: if consumer spending at beauty salons shows a negative trend of 5.5% (242 million euros), hairdressing salons are affected by a decrease of 8.4% (591 million euros).

The mass market, for around €4,300 million, shows substantial stability (+0.1%) characterized by a steady drop in sales over large surface areas (hyper and supermarkets), balanced by growth in the specialized and single-brand chains.

Some data may help to better understand the value of the sector: Italy is third for cosmetics markets after Germany and France with 35,000 people employed, which total 200,000 counting downstream activities.

54% of those employed in the sector are women (about 19,000), while the manufacturing industry average is stable at 28%. The total number of university graduates among the employed is 11% against a national average of 6%, and the women with a university degree number about 1,700, 45% of those with university degrees in the sector. In addition to workers specialized in pharmaceutical chemistry and cosmetology, many are specialized in economy and marketing for the channel.

Regarding innovation and technology, the research and development that the cosmetics companies in Italy invest is about 7% of the turnover against a national average estimated to be about 3%.

And let's not forget that cosmetics covers 44% of investments in communication of non-food assets and that 65% of the make-up distributed worldwide is made in Italy.

The export/production ratio was equal to 33% at year-end 2014; contiguous sectors, like shoes, have a ratio of 80%: therefore there are still wide margins for the sector's internationalization processes. Since 1990 cosmetics products export has grown on average by over 10% a year.

In 2014, the industrial sector of the Italian cosmetics industry continued to mark an exception in Italian manufacturing: production went up, by 1%, with turnover at approximately 9,280 million euro. This performance confirms the unique nature of an industrial sector that is still sufficiently unaffected by Italy's economic difficulties. Consumer trends are still being impacted in Italy and in the last twenty-four months this has also influenced the domestic cosmetics market; at international level, the industry has, on average, picked up. However consumers,

although now more selective in their purchases, do not want to go without cosmetics and personal care products. Consumption has decreased in terms of value, but the number of items purchased has gone up by a few percentage points.

The fall in domestic demand has led to a decrease in revenues with a loss of 1.2% and a value of just over 6,100 million euro. In particular, positive trends were recorded for door-to-door and mail order sales, which combined increased by +4.4%, and in herbalist store sales which, when included in mass market sales, went up by nearly 3%. Pharmacy channel sell-in was also buoyant (+0.3%), while the perfume shop channel continued to decline (-3.8%) confirming, for several years now, the structural crisis affecting the segment, although some signs of innovation may be glimpsed. The mass market (+0.1%) remained steady at 2012 figures, with values just under 2,900 million euro.

Analysis of the domestic market as the target of revenues shows that professional channels continued their poor performance, down by 3,5% with a sell-in value of just over 700 million euro. The decline in the number of visits to beauty salons and hairdressers (which were most affected by the economic crisis that came to the fore in 2008) continued in 2014: the immediate effect was a decrease in the use of cosmetics for services and re-sale.

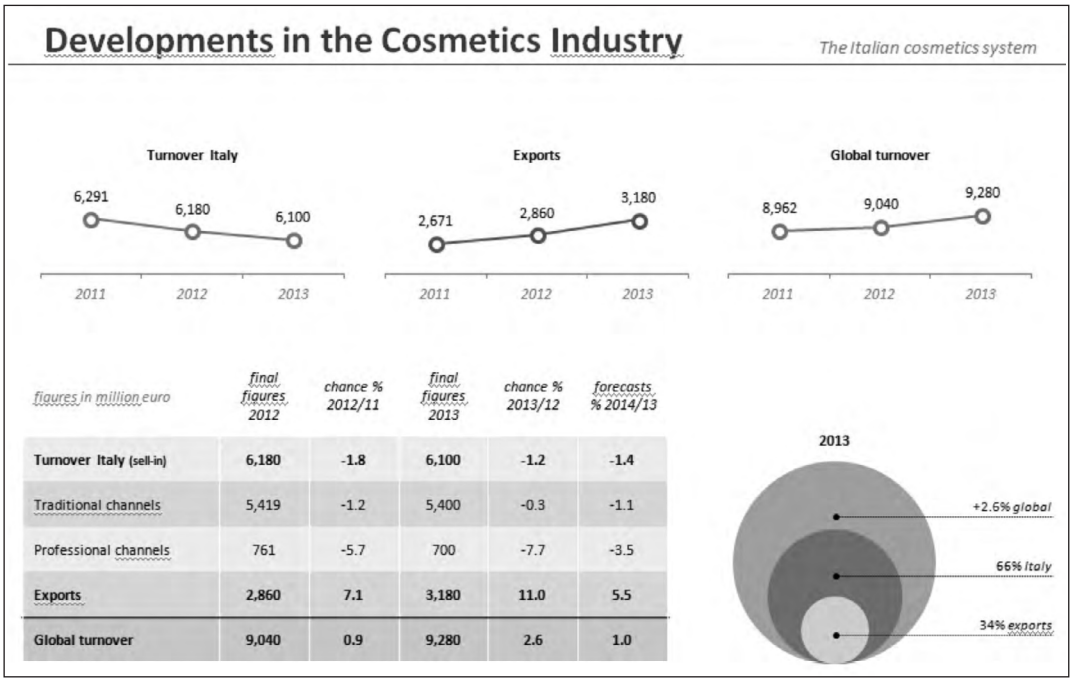


Fig. 1

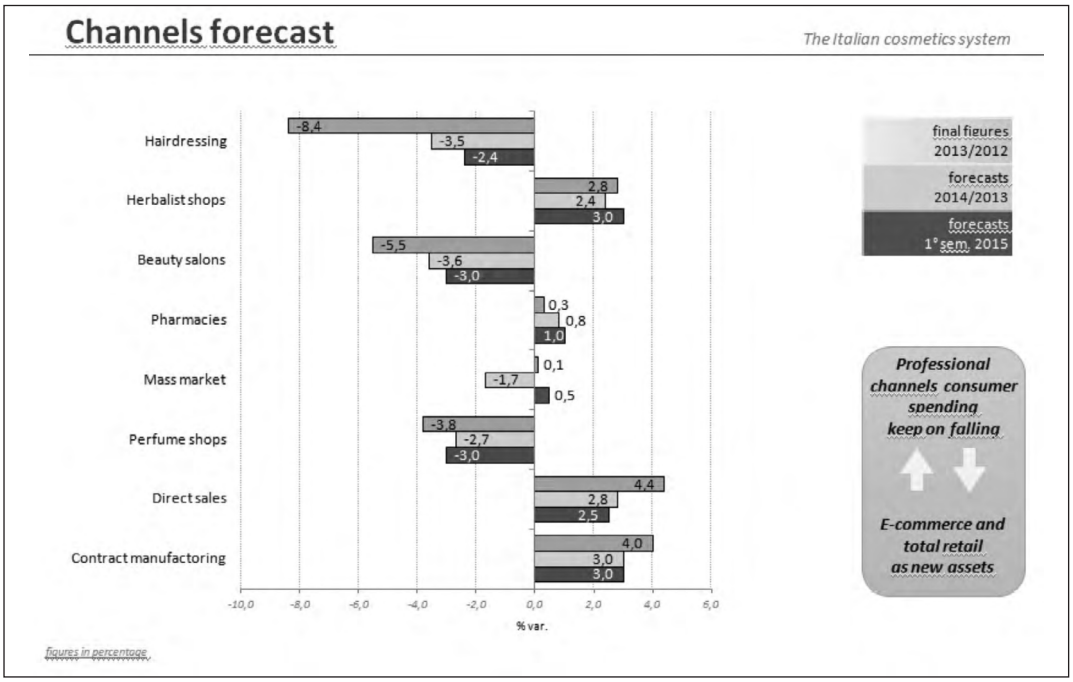


Fig. 2

Domestic sales of cosmetics, affected by a general economic situation that is still negative, could not support the turnover of Italian companies, while in 2014, as in previous years, the considerable performance of exports led to a major recovery in profitability. International sales increased by 5,5%, to account for 3,300 million euro. Imports, with a value of just over 1,600 million euro, recovered, albeit marginally (+1%), confirming the downsizing of domestic demand, geared towards products offering a better price/quality ratio. Due to these trends, the trade balance of the industry was widely positive, with a record figure of nearly 1,600 million euro.

The breakdown of turnover by distribution channel shows important developments: compared to the previous year, the mass market declined slightly, though this trend was less evident as herbalist store sales, increasing by more than 4%, with 31% of sell-in values, were included. Other channels were basically stable, apart from the downturn in professional channels which account for 7.6%. Exports, which account for 34% of turnover, increased, as well as door-to-door and mail order sales (accounting for 5.6%), while sales in the pharmacy channel (accounting for 9%) were slightly down. Sales of perfume shops, which account for just under 13%, fell, but are still a driving force of the entire industry, and the second market channel on domestic market after the mass market.

At a time when the economy is still struggling to recover, the trend of turnover, i.e. of domestic revenues, reflects the robust and competitive nature of the cosmetics industry and effectiveness of a strategy focussed on continual research and innovation. Industry fundamentals and in particular the target of investments, which are still above average, confirm this pattern: at present, cosmetics companies invest more than 6%

of turnover in innovation, against an average 3% invested by Italian manufacturing companies. Italian companies have been able to tackle the crisis with increasingly effective internationalisation policies. The Italian cosmetics industry is recognised worldwide for its innovative formulations and the dynamic service of its manufacturers, and these characteristics have enabled this supply chain to make a name for itself on both traditional and emerging markets.

Italian cosmetics companies are mainly concentrated in the north of the country, with a geographic segment weight of over 82%; just one year ago this figure stood at 80%.

Lombardy ranks first, with the highest density of cosmetics companies at over 52%, followed by Emilia Romagna with over 10%, Piedmont with 7.1% and Veneto with 8%.

For the second year running, the value of cosmetics sales fell slightly: 1.2%, with a value of 9,522 million euro. This trend is not generally attributable to the economic crisis, but instead to consumers rationalising their choices and shifting towards channels and price ranges that are cheaper, without foregoing premium products, thus weakening the intermediate price range: consequently, the "hourglass effect", which clearly reflects the polarisation of sales, is exacerbated. Considering volumes in terms of quantities, sales have remained the same, while fewer visits to professional salons have had an impact. All traditional channels recorded a slight and differentiated downturn in 2013, apart from herbalist stores and direct sales channels. Sales at herbalist shops went up by nearly 3%, followed by door-to-door sales (+4.3%) and mail order sales, with the highest increase of +4.6%.

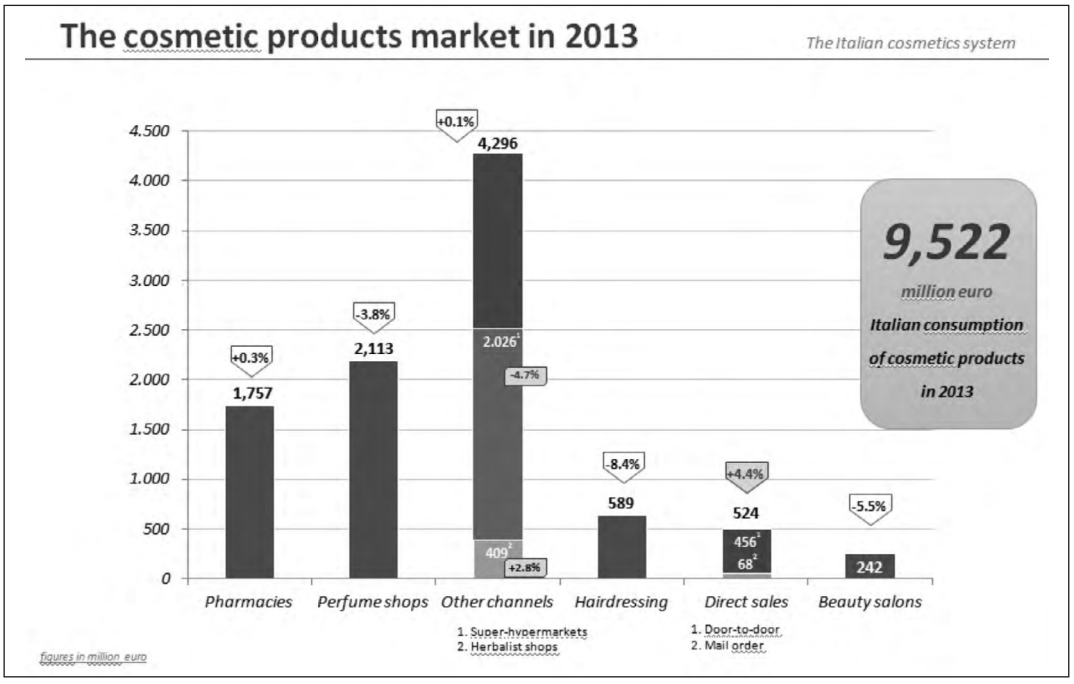


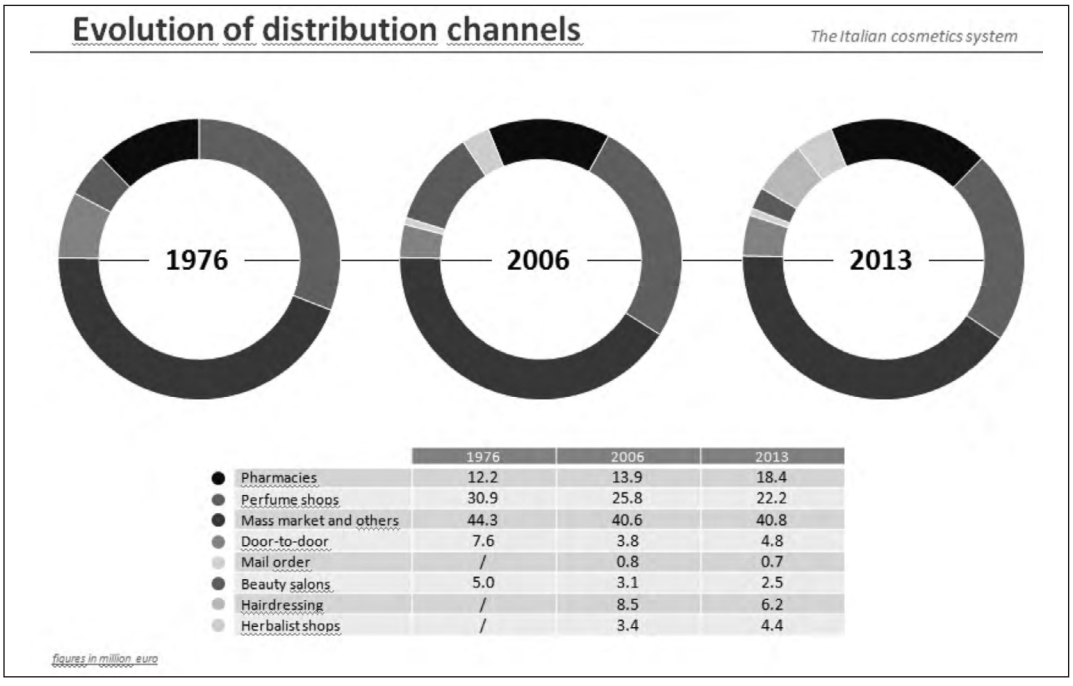
Fig. 3

Sales at pharmacies and in the mass market picked up slightly (+0.3% and +0.1% respectively). The decline of perfume shops (-3.8%) continued, with sales figures down, confirming the divergence of the channel. On the one hand, sales at traditional perfume shops were down, in terms of the number and weight, and on the other hand specialist chains, that are more attentive to customer service and new needs, were streamlined. In 2013 professional channels recorded a downturn: sales at hairdressing and beauty salons fell by 8.4% and 5.5% respectively.

In 2014, price trends appeared to be on the up, with perfume shops recording the most considerable increase among traditional channels (+2.4%). In professional channels, the increase in margins did not produce considerable effects, due to the significant decrease in quantities.

Figures from Cosmetics Europe, formerly COLIPA, the European Association representing the Cosmetics Industry, once again confirm Germany as the leading nation for sales in 2013, with 12,896 million euro, followed by France with 10,542 million euro. The United Kingdom ranks third, with sales falling by 2.5% and accounting for just over 9,900 million euro. Italy ranks fourth for sales in Europe, followed by Spain with sales down by 4% and a value of 6,433 million euro. The concentration index shows that the first five countries cover just under 70% of the European market, which recorded a total value of 72,060 million in 2013, reporting a slight decrease of 0.8%.

Toiletries and skin care products are the first segment in European sales, accounting for 25.3% of the total. Europe, with 72 billion euro, ranks first in world consumer trends, followed by the United States (47 billion), China (29 billion) and Japan (18 billion).



	1976	2006	2013
Pharmacies	12.2	13.9	18.4
Perfume shops	30.9	25.8	22.2
Mass market and others	44.3	40.6	40.8
Door-to-door	7.6	3.8	4.8
Mail order	/	0.8	0.7
Beauty salons	5.0	3.1	2.5
Hairdressing	/	8.5	6.2
Herbalist shops	/	3.4	4.4

figures in million euro

Fig. 4

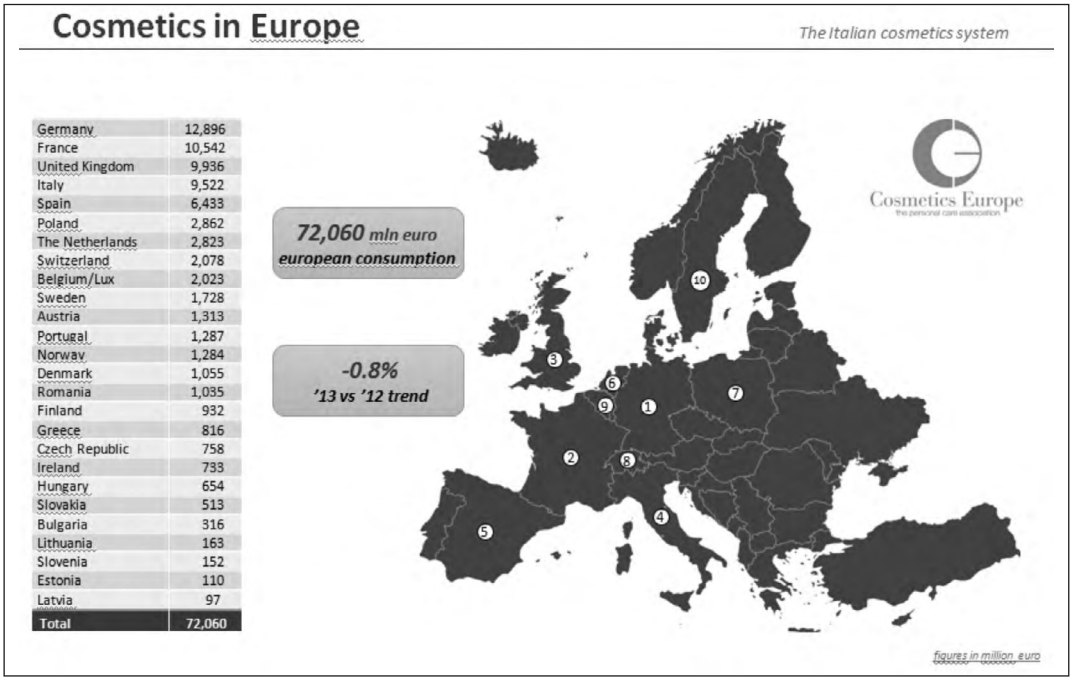


Fig. 5

After years of holding up against the current economic crisis, the cosmetics market came to a standstill in 2013. Sales of cosmetics in Italy fell by 1.2% to 9,522 million euro, a figure close to that recorded in 2009. The result was slightly better than the previous year (-1.8%), and reflects a renewed confidence in consumers and the consumer spending trends affecting the period after the world crisis in the third quarter of 2008.

8,164 million euro of total cosmetics sales are from retail channels, with an overall decrease of 0.9%, partly supported by the performance of single-brand stores in the mass market and sales of cosmetics at herbalist shops. The pharmacy channel held up, after negative trends affecting multiple product lines in 2012. On the contrary, the domestic market performed well in terms of exports, up 11%, confirming the ever increasing capacity of Italian cosmetics companies to adapt to new characteristics of expanding markets and diversified purchase options of consumers.

In 2014, the most evident characteristics of the Italian market included the broad-ranging nature of sales and "non-channel" choices; mass market lines were driven by specialist (see page 15) and single-brand stores.

Analysis of foreign trade data is based on statistics processed each year by the Statistics Dept. based on figures from ISTAT. ISTAT periodically applies corrections made, also during the period when surveys are conducted, revising figures of previous years: thus the statistics produced by Cosmetica Italia adjust values of relative years. Apart from rare occasions, the weight of deviations is always marginal.

After three consecutive years marked by a strong recovery in exports, this segment further increased in 2013, exceeding the threshold value of 3 billion euro. In fact exports of Italian cosmetics

reached a figure of 3,176 million euro, with an 11% increase. The final figures for quantities are significant: an increase of 17.5% was reported confirming the focus on internationalisation, not only on a marginal level.

In line with figures for the previous year, imports totalled 1,639 million euro, up 0.8% compared to 2012, and bolstered by a more significant increase in quantities, near to 6%.

Due to fewer tensions on foreign markets, the trade balance for the cosmetics industry confirmed the trend that started in 1996, when the value of exports of cosmetics exceeded the value of imports. In 2013, this balance was close to 1,540 million euro, and is still well above many similar goods' categories.

The gradual recovery of some foreign markets, despite an overall uncertainty, clearly contributed to Italy's trade performance, which improved considerably after the physiological decline of 2008-2009.

Safe formulations and continual product innovation have helped retain shares on individual markets and driven performance in new areas of excellence, confirming the quality of Italian products in the cosmetics industry.

The export/turnover ratio in 2014 was equal to 33%, no doubt boosted by the improved trend of major European markets and rapidly developing markets in Africa, the Middle East and Asia. The value is still low as regards the cosmetics industry's focus on internationalisation processes, yet is positive in terms of new opportunities for development on foreign markets.

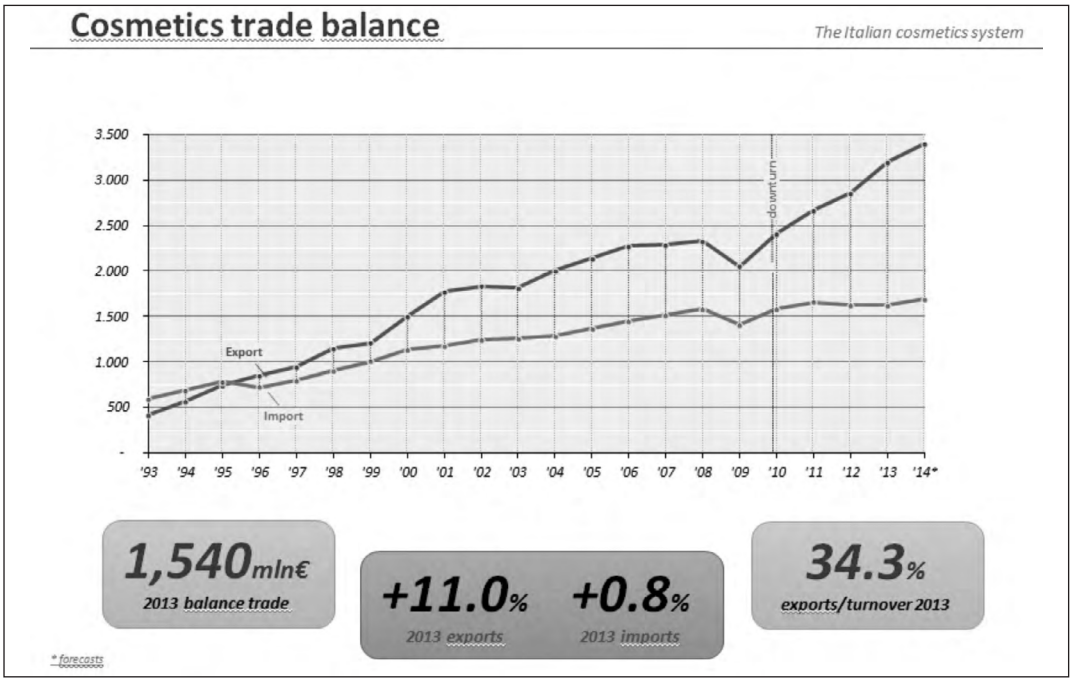


Fig. 6

In 2013, the product types that most contributed to export performance were toilet waters and eau de colognes with a total volume of 558 million euro and an increase of more than 14%, creams and other products, with an increase of 4.7% and a value close to 565 million euro, and eye make-up products up 8.9%, with a value going up from 183 million euro in 2010 to the current figure of 286 million. A negative performance was instead registered for body deodorants, down by 13.4% with a value of 71 million euro and bath preparations, down by 14.9%.

Exports of hair products picked up: shampoos performed well, up 5.7% and accounting for more than 153 million euro, in addition to lacquers (with a value close to 30 million) and the combined category of hair lotions and other products for haircare, which came close to 440 million euro and reported an increase just under 6%.

Figures for hair preparations fell slightly, by 2.7%, with a value just under 8 million euro.

In 2013, foreign trade flows continued to confirm the sudden changes in economic tensions of individual countries which were all able to tackle the financial crisis of the last few years.

The most significant imports, as regards value, were creams, up by 2.0% and accounting for over 533 million euro, and toilet waters and eau de colognes, down by 8.1% and with a value close to 208 million euro.

Europe is the main market for exports of cosmetics, with 2,150 million euro, thanks to a considerable recovery in demand from historically important countries such as Germany, France and the United Kingdom. For the first year, all top 10 export countries recorded positive trends, often with double-digit figures.

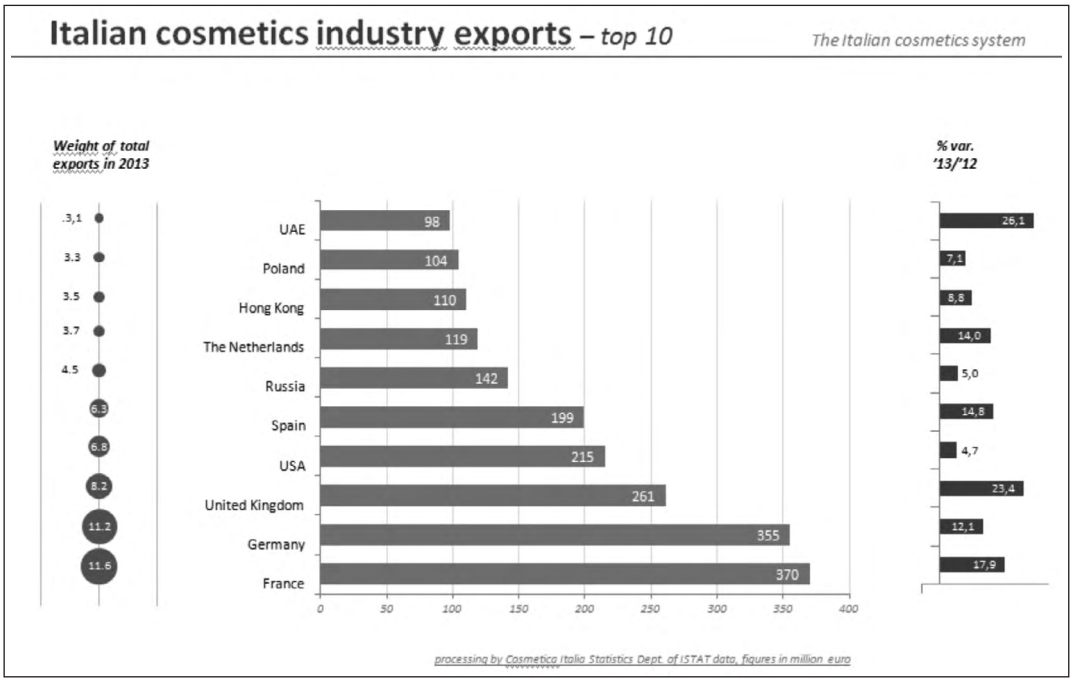


Fig. 7

The United Arab Emirates picked up considerably (+26.1%), with a value close to 100 million euro, as well as the Netherlands (+14.0%) and Spain (+14.8%): the volumes for these countries are improving, above all as regards the internationalisation policies of companies in the sector. On average, growth for these three major players in the international cosmetics industry, has exceeded 40% in the last three years.

Generally speaking, the increase in values of exports from Italy was uniform: Asia, with a value of 560 million euro, reported an increase of 9.5%; America, with a value close to 340 million euro, reported an increase of 3.7%, while Africa recorded a strong increase in Italian exports, with a figure up by 19% over the previous year. Oceania was the only nation to record a decrease, of 11.6%, with a total value of 43 million euro.

A ten-year comparison of main export markets in Asia, in the context of the Association's internationalisation plan, is striking: the total value of China, Singapore and Hong-Kong went up from 53 million euro in 2003 to 195 million euro in 2013; this increase will no doubt go on while the economies of these nations continue their significant growth trend.

The growth in exports of Italian cosmetic products is due, besides the global recovery in consumption, to qualified products, safe formulations, continual investment into research and innovation and the ability to meet the most wide-ranging needs of markets, in terms of service, and as regards production lots and the specific requirements of local consumers. In 2013, besides the increase in the value of exports, for the first time ever, quantities went up considerably: by 17.5%, to account for a volume just under 540 thousand tons.

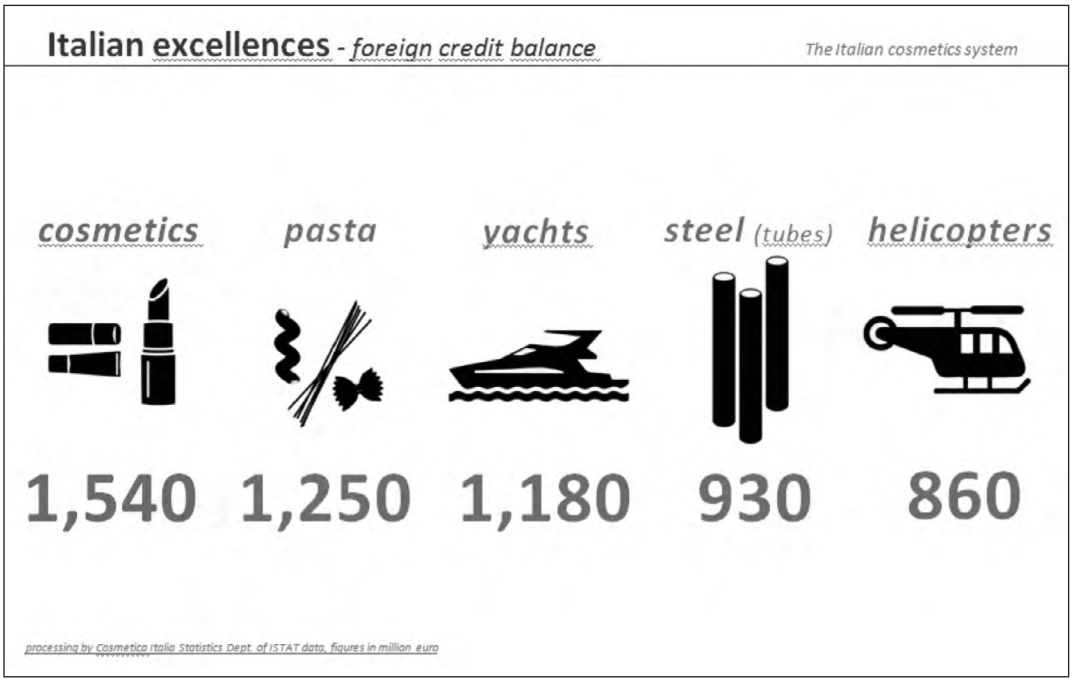


Fig. 8

The continual increase in exports of cosmetics, up by 11% and accounting for a value of 3,176 million euro, had a positive effect on the balance of payments (difference between exports and imports): in 2013, the trade balance generated by cosmetics companies exceeded 1,500 million euro, which is a remarkable result and far higher than important sectors such as pasta (1,250), steel tubes (930), helicopters (860) and yachts (1,180).

A comparison between export values in 2003 and 2013 show developments in Italian exports of cosmetics. Besides a general development, values went up from 1,830 million euro to 3,176 million euro, and specialisation levels per product improved, with perfumes ranging first with 26% of exports, followed by hair products which went up from 15% to 20%; products for body care reported a slight downturn, accounting for 18%, while make-up products increased from 14% to 17%.

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AN INTERESTING CONGRESS IN A WONDERFUL AND WARMING CITY: BEIJING

Xing-Hua Gao[1], Jianzhong Zhang[2] , Hong-Duo Chen[1] and Piefrancesco Morganti[3]

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In the wonderful setting of the magic city of Beijing, from September 26 to 28, 2014, was successfully held the 11th International Congress of Cosmetic Dermatology, organized by Chinese Society of Dermatology, Peking University People's Hospital No. 1, and China Medical University, under the auspices of International Society of Cosmetic Dermatology. There were 309 submissions included in the Congress proceedings, among them 135 papers were presented during the two-day events.

After the introductory remarks reported from Wei Liu, Head of Dermatological Department, Air Force Hospital of Beijing, Ya-Fei Liu Deputy President of Chinese Medical Association, Hong-Duo Chen, President of International Society of Cosmetic Dermatology, Jian-Zhong Zhang, President of Chinese Society of Dermatology and Pierfrancesco Morganti, as Secretary General of the International Society of Cosmetic Dermatology the Meeting started by 5 Plenary Lectures which have opened a door for the *Innovation in Horizon*, where the green economy will be at the center of the future progress. Dozens of world renowned dermatologists and scientists presented on a variety of topics covering laser treatment, usage of retinoic acid, skin rejuvenation, fillers, dermatologic surgery, photo-protection, antioxidant in cosmetic conditions, skin imaging and skin bioengineering, traditional Chinese medicine in cosmetic dermatology, complications and pitfalls in cosmetic dermatology, et al. In addition, topics on cosmetic regulation, impact of environmental pollutions on skin, view of beauty from East and West were also hotly discussed. Prof. Henry Lim from Henry Ford Medical System explained in details what's new in photoprotection.

Prof. Pierfrancesco Morganti, secretary general of International Society of Cosmetic Dermatology, outlined the bright future of developing environmental friendly cosmetic products. Prof. Evangeline Handog, president of International Society of Dermatology, stressed specifically the management of pigmentary alterations in acne. Prof. Sewon Kang from John Hopkins University presented the influence of epigenetics on skin aging. Prof. Jianzhong Zhang, Congress president and president of Chinese Society of Dermatology, discussed basic and specific classification of androgenetic alopecia and Chinese guideline for management of AGA. Prof. George Cotsarelis from University of Pennsylvinia introduced cellular and molecular understanding of androgenetic alopecia. Prof. Xing-Hua Gao, Congress president from China Medical University, displayed the treatment advances in recalcitrant vitiligo and vitiligo with prominent cosmetic consequences. Prof. Mark Pittelkow from Mayo Clinic, educated on the recent advances in scarring.

The new concepts and new technologies in cosmetic dermatology were fully communicated during this congress. Stress, oxidants and pollution at the base of many skin disorders, together

with the more modern therapeutic means used today to solve many pathologies affecting skin and hair, were reported and discussed by scientists coming from the main China, Japan, Philippines, South Korea, USA and Europe.

Skin, in fact, serving as a barrier against all the external assaults is the potential target of the environmental oxidative stress, one of the major determinants in skin aging. Thus, when the natural antioxidant defence mechanisms fail, or an increased flux of reactive oxidants from endo- and exogenous sources exceed the skin antioxidant capacity, oxidative injury will result.

Oxidative stress, therefore, is referred to as a condition of imbalance of pro-oxidant/antioxidant equilibrium, in favour of the former. According to Achimichi Morita from Nagoya City a University, Japan, some epidemiologic studies have shown that water-soluble tobacco-smoking extract induced skin aging, the production of metalloproteinases (which degrade collagen), resulted increased as well as the hydrocarbon receptors, which mediate the toxicity of several environmental contaminants were triggered. On the other hand, Umberto Cornelli, from Loyola University School of Medicine, Chicago, USA, has underlined the connection between the oxidative stress and the total cholesterol, considered at the basis of hydroperoxide plasma levels. Moreover, according to Tie-Chi Lei, from Dermatological Department of Wuhan University, China, the oxidative stress, provoked from hydroquinone used as depigmenting agent, seems to be the main cause of the melanosome degradation, acting as a pro-oxidant agent. These studies open the door for the treatment of post inflammatory hyperpigmentation (PIH), a common sequelae of inflammatory Dermatoses, as shown in acne-affected patients, where a combination therapy is necessary, according to Evangeline B.Handog from Asian Hospital and Medical Center, Philippines, and Henry W Lim, from Dermatological Department of Henry Ford Hospital, Detroit, USA. In the treatment of PIH, Lin has combined topical corticosteroids as mono therapy to monobenzyl ether of hydroquinone, underlining how the chronic use of these ingredients can be cause of permanent depigmentation, provoking vitiligo-like side effect. Vitiligo treatment has been the topic of Xing-Hua Gao, Department of Dermatology, No 1 Hospital of China Medical University, and Shenyang. He showed Interesting results obtained on severe vitiligo-lesions on face, treated by calcineurin inhibitors and/or phototherapy. Unfortunately, vitiligo on hands and feet resulted very resistant to conventional treatments, while ablative laser-aided steroid delivery combined with UV-therapy irradiation seem to be the best promising therapy.

Photodynamic and laser therapy, hypo and hyperpigmentary disorders and the use of stem cells, growth factors and new technologies to minimize the problem of keloids and improve the microenvironment or skin aging, were among all the more discussed topics.

Nanobiotechnology, in fact, promises to revolutionise the use of biomolecular processes, at cell level by the development of new nanocomposites and devices for biological and biomedical applications. Scientists, in fact, have harnessed the cell' ability to interact with other cells for developing new material with a living component. Restoration of aged skin and burned, wounded tissues are the possible applications by the use of advanced natural fibres entrapping active ingredients obtained from stem cells also, according to Yu Yanqiu, Department of Pathophysiology and Hangdeng Tu and Yuannhong Li, Department of Dermatology China Medical University of Shenyang. About the future of the cell therapy by stem cells, it has been underlined how some in progress studies aim to restore faith in the use of gene therapy of *Primary immune deficiencies* (PIDs) This study utilises genetically modified haemapoietic stem

cells' as a cell-based therapy for building a healthy immune system in patients with PIDs .In addition Marco Palombo, Burn Unit and Plastic Department, S. Eugenio Hospital, Rome, Italy, reported his personal experience on the utilization of new advanced medications made by a specialized nanocomposite tissue based on the use of Chitin Nanofibrils and plant polymers, entrapping active cicatrizing and antibacterial agents. The goal of this treatment on burned skin has been to obtain a complete reconstruction of the skin in a week maintaining the bandage *in loco* for all the period, without any kind of bacterial invasion.

Naturally, during the discussion it has been underlined how the use of new cosmetic products of recognized high quality (based on the use on block-copolymer nanoparticles) and/or topical devices of new generation (obtained by the use of natural polymers and casting and electrospinning technologies) may represent innovative solutions for advanced medications and beauty masks for the treatment of photo-aged or precociously aged skin. In any way, all the products have to be well regulated by the international laws to enhance the consumer protection, as well as to be also protected by patents to safeguard the intellectual properties both of research and industry.

Last but not least, there is a growing necessity to recognize that the transition to a green-bio-economy, based on the use of waste materials and bio-nano-technologies, consuming low quantity of water and energy, could generate a more sustainable growth. This new way of producing goods will address the decline/loss of ecosystem services, slowing down the increasing natural disasters, preserving the natural resources, and maintaining the biodiversity of the planet. For these reasons biotechnology will be an important pillar of Europe's economy by 2030 as well as of USA and China economy to meet the future global challenge of a sustainable industry.

On one hand, medicine and novel technologies, based on the use of industrial natural by-products obtained from fisheries and plant biomass will play a prominent role to produce new products with added value for consumers. On the other hand, innovative nanocomposites made by natural polymers will be indispensable to reduce production and use of petrol-based plastic containers, ranging today the $374-billion-a-year production! It is also to underline the necessity to really use the ~300 billion-year of biomass (from plant and fishery's) which actually represents an underutilized raw material. 20% of fishery's waste is used to make goods, while only 5% of plant biomass is used to produce energy!

Interestingly have been also some unusual topics for a Dermatological meeting, which have been dedicated to the Cultural heritages, Patent protection and EU Cosmetic regulations respectively, with the idea necessary to enhance consumer protection and market development . It has been shown how Cultural heritages, R&D, and Innovation have to be considered the pillars of a sustainable progress, fundamental to maintain the respect of both the human Health and the ecological environment, as evidenced in Piefrancesco Morganti's presentation. By this point Antique Roman and Chinese Empires had the possibility to civilize Western and Eastern Countries respectively, having always in Mind to maintain mens *sana in corpore sano* (healthy brain into a healthy body). The cultural heritage has to remain at the basis of the progress. This is why China President, Xi Jinping, just during our meeting, remembered to Chinese the *necessity to revive their own culture*, according to the philosophic ideas and way of living of their ancient ancestor Confucius.

Naturally, all the innovations recovered by research studies have to be patented to protect the intellectual properties of the inventor. This the interesting topic developed from dr. Claudio

Germinario, patent attorney of the Società Italiana Brevetti, Roma, Italy, active in this field from more than 10 years! Without entering in the meaning and explication of the intellectual property protection, it is interesting to remember that "Chinese law, like the European Patent Convention considers patentable not only medicines or active principles intended as chemical entities, but, more interestingly, their first, second and subsequent therapeutic applications. What the meaning? "Any substance although known in the prior art, having pharmacological activity or causing a pharmacological effect may be eligible for patent protection when it is finalized to a novel therapeutic application".

About the rules governing the cosmetic products, according to Sonia Selletti, known lawyer into the Studio Legale Astolfi e Associati, Milano, Italy, "the legislator has underlined the need to firm on a clear demarcation between cosmetics and similar health products (medicines, medical devices, biocides, food integrators) in an attempt to avoid overlapping classifications relative to the so-called borderline situations, so that the correct sector regulation can be identified".

In any way "the function of cosmetics, being established at a legal level, leaves plenty of scope for research, development and innovation in terms of functions such as *protection* and *maintenance* onto which one may graft the most advanced cosmetic qualities that are in a position to establish said products as functional cosmetics, even if they are also recommended in other specific or complementary contexts such as therapeutic ones".

These are just a few of the many other interesting topics presented during the two days meeting with more than 1,500 participants, young and expert scientists.

At the closure of this interesting meeting, special awards were given to some young researchers also and the ISCD President, Prof. Hong-Duo Chen, announced that the 2016 International meeting will be held in Jakarta, Indonesia.

Fig. 1 The Venue of the 11th International Congress of Cosmetic Dermatology.

Fig. 2 The Opening Ceremony.

Fig. 3 The Opening Ceremony.

Fig. 4 Attendees.

Fig. 5 Prof. Wei Liu.

Fig. 6 Prof. Jianzhong Zhang.

Fig. 7 Prof. Hong-Duo Chen.

Fig. 8 Prof. Pierfrancesco Morganti.

Fig. 9 Prof. Sewon Kang.

Fig. 10 Prof. Hong-Duo Chen, Prof. Pierfrancesco Morganti and Prof. Jianzhong Zhang chair the plenary lectures

Fig. 11 Prof. Henry Lim.

Fig. 12 Prof Xing-Hua Gao.

Fig. 13 One of the scientific session.

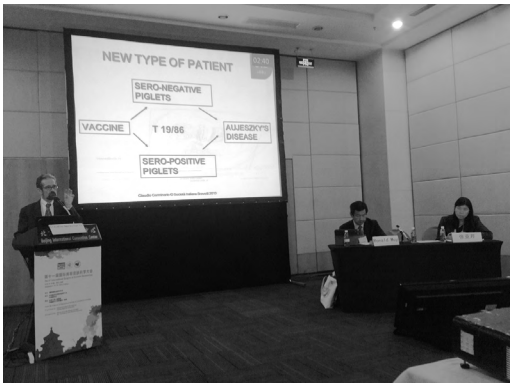

Fig. 14 Dr. Claudio Germinario.

Fig. 15 Prof. Jianzhong Zhang awarded the speaker certification to Prof. Handog, president of International Society of Dermatology.

Fig. 16 The awarded certifications.

Fig. 17 The awarded certifications.

Fig. 18 Prof. Jianzhong Zhang closes the meeting.

Fig. 19 Some of the speakers.

Fig. 20 Some of the speakers.

Fig. 21 Prof. Hong-Duo Chen, Prof. Pierfrancesco Morganti and Prof. Sheng-Quing Ma.

Fig. 22 Gala dinner.

Fig. 23 Some speakers at dinner.

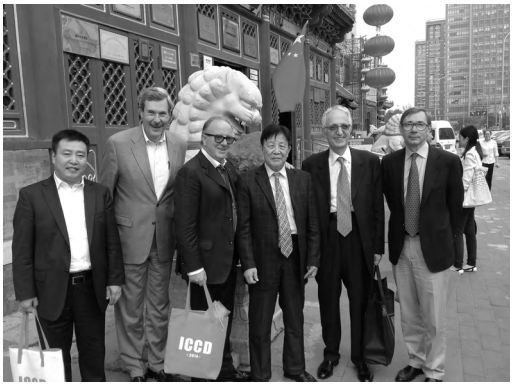

Fig. 24 Some speakers in the beautiful Beijing.

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CULTURE AND BIO-GREEN ECONOMY AS PILLARS OF THE PROGRESS. The Bio-Mimetic EU project goes in this direction

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The green-bio-economy is characterized by the attention to maximize resource productivity (energy, water and natural raw materials) and reduce waste generation, maintaining the planet biodiversity (1-3). At this purpose, public policy will play a key role in enabling green economy goals and enshrining its core values in policy and practices. Thus EU, going in this direction, has the ambition to built the world's most competitive knowledge-based bio-economy, leading to the creation of new innovative goods and services, enhancing its competitiveness by the use of renewable sources (4). In addition, the bio-green-economy could create more egalitarian trading system. "Fossil fuels and petrol chemistry, in fact, give only a few countries a strong advantage, while biological resources are widespread, giving all countries a more equal chance". Moreover it is not to forget that global fossil fuel subsidies totalled US$ 409 billion in 2010 and are projected to reach US$ 660 billion in 2020. It is also estimated that removing these subsidies would reduce global carbon emissions by almost 7%! (5). However, the bio-green economy shows great potential for delivering a *triple bottom line* of job-creating economic growth coupled with environmental protection and social inclusion (6).

In any way, the knowledge-based bio-economy will play an important social, and environmental potential role, being a sector estimated to generate a turnover of more than €1.5 trillion per year in Europe. It is to remember that investment in science is necessary, but not sufficient because all participants in the chain, such as farmers, industry, regulators and consumers, will need to get to make the bio-green-economy work" (7,8). The progress, in fact, has not to be focused exclusively on the science to the detriment of social dialogue, but it is necessary to understand the people needs, having an acceptable general and ethical consensus also. Consequently, the policy-maker strategy has to cover a complex range of areas and inter-related issues, having a constant eye on the ever-evolving terrain. Thus, also if life sciences and bio-nanotechnology can help find solution to many of the most pressing challenges, the Europe's success will require a long-term and coherent vision. This is the reason why the research investments by the 7th EU Program of last years, are going on by the new Horizon 2020 (9).

This is also the challenge of the Bio-Mimetic project (www.biomimetic-EU-project.eu) that, involving research partners from different EU Countries, has the objective to develop new bio-processes and bio-polymers obtained by enzymatic reactions, as Eco-innovative solutions for a wide range of products, such as innovative household cleansing agents, cosmetics and non-

woven bio-textiles.
Coordinated from Dr. Anju from P&G UK, and after the meeting held in Bremen, the research group had the mid-time meeting in Rome discussing on the last results obtained conjugating different natural polymers from plant biomass by enzymatic reactions.
The goal, of the Bio-Mimetic research group is, in fact, to obtain new goods, substituting the usual chemical reactions with bio-based means, just copying the enzymatic methodologies used in nature. Thus it has been possible to make innovative emulsions and original non-woven tissues by the use of bio-conjugating natural polymers skin friendly and environmentally friendly. It is interesting to underline that the cross-linked polymers, obtained in the laboratory of Prof. Claudia Crestini of Torvergata University in Rome, included into nano emulsions and non-woven tissues, have shown interesting biological activities on keratinocytes and fibroblast cultures. Both the emulsions and non-woven tissues, made by the electrospinning technology, were produced in the Nanoscience Centre MAVI (www.mavicosmetics.it)
The meeting held in Rome, June 17-18, has been at the same time *scientific*, for the Interesting results reported and discussed, and *cultural* for the time dedicated to visit the *Musei Capitolini,* the most rich Museum in the world for the antique roman' sculptures, as shown below.
According to Prof. Guido Fabiani, Head for Economic Development, Latium Region, "Latium and Rome are globally well known for being one of the perfect scenario of the Italian style, due to the amazing mix of food, movies, arts, fashion, history, natural environment and tradition". This is the reason why the location selected for dinner was *Enoteca Palatium* (regional wine house) where it was possible to taste characteristic dishes and wines of the Latium Region.
In conclusion, during this 2-days meeting, all the participants had the possibility not only to study and discuss on innovative polymeric technology, but also to have a lovely views of part of the roman art and to delighting and enjoy excellent and local cuisine.
Not to forget the cuisine, it follows how to make a famous Roman dish:

Bucatini all'Amatriciana

Ingredients: 350 g bucatini; 150 g steaky bacon without rind; 500 g of grated Pecorino cheese.

How to make: thinly slice steaky bacon (no to salty) and brown with onion in oil.
Add tomato pulp (for pulp, peel and seed fresh tomatoes, put through the blender, or puree with vegetable mill) and a pinch of salt.
Cook on high fire, and chilli. Lower flame to obtain a thick sauce.
Drain bucatini "al dente", season and sprinkle with Pecorino cheese. Parmesan cheese can be a substitute for Pecorino in order to prepare a sweeter version of this dish, although it is not traditional.

From Bremen **to** **Rome**

Symbol of Bremen.

Symbol of Rome.

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Fig. 1 Dinner at Enoteca Palatium.

Fig. 2 Dinner at Enoteca Palatium.

Fig. 3 Dinner at Enoteca Palatium.

Fig. 4 Dr. Anju taking a cup of tea during the meeting-break.

Fig. 5 During the meeting.

Fig. 6 During the meeting.

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Structural Colors in the Realm of Nature

by Shuichi Kinoshita

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The structural colors appearing in nature often utilize special mechanisms capable to enhance the coloration by elementary optical processes.They are originated, therefore, from complex interactions between light and sophisticated microstructures created in the natural world. This book, organized by 9 Chapters, 2 Appendices, and an Index of Scientific Names, has been written on the basis of the physical phenomena and not of the coloration mechanisms of the selected species.

The physical basis for each color phenomenon has been reported, in order to give a reply to the interactions between light and microstructures recovered in different animal and plant species. Thus, the fundamental properties of light such as reflection, refraction, interference, and diffraction have been quantitatively treated, reporting many interesting studies made by the use of electronic microscopy and other modern optical techniques with the scope to verify the structural complex colors and related crystalline structures appearing in nature. This is the reason why the structural colors recovered in nature have been a subject of many scientific papers because of their applications in many industrial fields related to vision such as painting, automobile, cosmetics, display, and textile. However it has been shown that, in spite of the progress of the structural studies in biology, formation, functions, and the physical interpretation of many colors based on simple and natural microstructures are quite limited even up to now.

For all these reasons, after the *Introduction* reported on **Chapter 1**, **Chapter 2**, *Fundamentals of Structural Coloration*, has been entirely dedicated to the fundamental structural- based physical properties of light, with particular focus on the phenomena of reflectiveless due to single or multilayered thin-film interference, as well as on the color light scattering of photonic crystals or small colloidal particles.

It is believed, in fact, that the structural colors appearing in nature come from the following five elementary optical processes and their combinations: (1) thin-film interference, (2) multilayer interference, (3) diffraction grating, (4) light scattering, and (5) photonic crystal. Thus in view of coloration mechanisms, scattering of light by particles is completely different from thin-layer interference and photonic crystals, because it has a root in the irregularity of the structure.

The coloration due to light scattering is also known as non-iridescent in contrast to iridescent colors due to other mechanisms, such as thin-film interference. The mathematic formulations necessary to explain the physical phenomena of reflection and diffraction properties of light due to the geometrical structures recovered in nature are amply reported on **Chapter 9**.

Butterfly and Moths (lepidopteron species), is the topic of **Chapter 3**. These insects, whose wings are covered with mosaic tapestry of scales, are one of the most extensively studied species from the

optical aspect, such as pageantry, and structural colorations, visual mechanisms, antireflection effects on ommatidium and wing. The butterfly wing is typically covered with two types of scales: (a) the cover scale (glass scale) very specialized in shape capable to play many roles and (b) the ground scale (basal scale) less specialized. A scale is a thin, plate-like shape, asymmetric with respect to its surface and decorated with elaborate structures. It is considered to be a flattened form of a bristle that has a long, cylindrical shape with a hollow inside. However, the structural colors in lepidopteron scale are expressed by the elaborations in various parts of the interior structure of the scale such as ridge-lamella, microrib, window, and trabeculae.

The *Morpho* butterflies, living in South and Central America, are the most studied creatures for over a century. When the *Morpho* has observed in front of the wing, the perceived color is blue. But when the view direction is inclined obliquely while maintaining the direction perpendicular to the wing veins, one notice that the color does not change largely at first, while it changes into violet or dark blue, when the angle becomes large enough. On the contrary, looking towards the direction parallel to the wing veins, the blue color distinguishes and the wing turns black. Thus the bleu shining is quite sensitive to the perpendicular direction of light, evidencing the anisotropic reflection. In any way, the physical significance of the numerous studies have shown that: (1)the structural color originates mainly from the light interference within the crystalline shelf structure on the scale through quasii-multi layers interference ;(2) the slender shape of a shelf gives strongly anisotropic reflection; (3) the irregularity in the ridge height destroys the interference among neighboring ridges, which results in the diffuse reflection in a wide angular range ; (4) high reflectivity is realized owing to the presence of 6-10 layers in a ridge with a large difference in refractive index and with sufficiently small separation between adjacent ridges; (5) the pigment beneath the iridescent structure absorbs the unnecessary complementary color, and enhances the blue structural color, while with reducing pigment, the scattering at dorsal and ventral scales, and wing membrane adds whitish color to the wing.

Thus the coexistence of different crystallites and curved multilayer systems, and the cooperation with the pigment are essential for the structural color in these kinds of butterflies. In conclusion, the optical interaction between the cover and the group scales, the size of the cover scale compared to the iridescent ground scale play a decisive role. In addition the cover-ground interaction enhances the efficiency of the light scattering, which makes the wing more whitish, as well as the distribution of the pigment affects the visual effect of the wing.

Chapter 4 is focused on *Beetles and Other Insects*. The surface of insects are generally covered by a cuticle, composed of various complex chemicals such a as lipids, polyphenols, chitins and other compounds, which intertwine to form a solid material.

In general, the outer part of the insect body is divided into three parts: epicuticle, procuticle, and epidermis.

Epicuticle, defined as a layer lacking chitins, constitutes the outermost layer body, which is generally composed of four layers such as cement layer, wax layer, outer epicuticle, and inner epicuticle. Cement layer consists of various materials, such as protein with polyphenols, tanned protein with lipid, waxes stabilized with shellac, and so on. Wax layer consists of lipids of a labile nature with the function of water control. However, the exocuticle, brown or black in color, contains microfibrils of ~3nm diameter composed of ~20 chitin crystallites that, embedded into the protein matrix and arranged in a plane parallel to the surface are packed in a hexagonal or pseudo hexagonal array.

The tanning pigment involves quinonoid, phenolic molecules, and melanins produced by oxidation

of polyhydric phenols. And the color change from vivid apple-green to dull purple-brown, recovered on *Pycanum Rubens*, is due not only to the presence of two or more films of chitin content into its shield bugs, but it is also originates from the pigmentation. Thus, in the *Poecilocoris lewusi*, the brilliant yellow-green color is due to the multi layer interference with the absorption layer placed beneath, while the multilayer in the reddish-brown area is not effective to produce the structural colorant, the pageantry color is considered the primary cause.

In addition to the structural coloration in shield bugs, few works have been reported, for example, on cicada's transparent wing and, while the contribution of scales to the total reflection seems small enough, the silverfish phenomenon continue to be an unsolved problem of the modern Science.

Structurally coloured barbules in avian species are normally composed of well-ordered melanin granules which, arranged in different shapes, cause black, grey, and brown colors in their feathers. These granules play an important role in displaying structural colors by organizing themselves into regular structures, also through the enhancement of the colors as background absorbers.

On the other hand, the structural colors in the barbs are somewhat mysterious, because the barbs are filled with a random network of sticks or random distributions of air bubbles, which do not contribute to the light interference at a glance.

Birds is the topic of **Chapter 5**, where the structural colors of the peacock feather' barbules are amply reported and discussed.

A feather of peacock consists of many barbs sticking out from a main shaft and each barb has a lot of barbules, the surface layers of which consist of keratin arranged with melanin rods in a plane parallel to the surfaces along the longitudinal direction. The rods are bound to each other by the keratin band. Thus, the photonic band structure using the refractive indices of keratin and melanin have been calculated, also if the sophisticated calculations employed do not essentially reproduce the actual, appearance of the peacock feather. However, it is important to consider both the regularity due to the photonic crystal and the macroscopic arrangement in order to reproduce the actual appearance of the peacock.

Another interesting phenomenon is represented by the neck feather of the common *Columbia livia* which shows unusual optical characteristics: the green (purple) feather located at the neck suddenly changes its color into purple (green) only by slightly shifting the viewing angle, which is quite in contrast to the gradual color change observed in usual iridescence. The color of the rock dove's feather is mainly due to numerously striking barbules, whose length, width, and thickness is topically 350, 40, and 3 um, respectively.

The cross section of barbules is crescent-shaped, producing a very broad reflection pattern in one plane under light illumination. However, the neck feather of rock dove is actually caused by the simplest mechanism of thin-film interference.

The most important point to produce the *two-color iridescence* is, therefore, based on the fact that the separation of the two adjacent peaks in wave number unit coincides with that of the color-matching functions of human vision for the blue and red ones. Thus, it has been recognized that light scattering can be somehow modified, contributing effectively to the animal colors.

Chapter 6 has been focused on *Fish*, representing one of the well-known animals abundant in structural colors, controlled by specialized cells called chromatophores.

The most characteristic point in fish is that their color-producing structures, cause of the optical phenomena, are embedded in living cells. Thus, they are dynamically controlled by the nervous system,

being also under hormonal and physiological conditions. In any way, the beautiful and spectacular colors in fish that appears as brilliant colorings and splendid reflectors in skins, scales, corneas, and tappet, are all achieved by the combined action of their five chromatophores named: melanophore, xantophore, erytrophore, leucophore, and iridophore. While melanophores make the skin brown or black, xantophores and erytrophores contribute to yellowish and reddish colorations respectively.
In addition leucophores bear the whitish appearance owing to the light scattering, while iridophores play a central role in the structural colorations within the fish skin. The last chromatophores, in fact, involving definite stacks of a multilayer system of purine crystals (guanine, hypoxanthine and uric acid), constitute a piling up of a large number of crystal- layers capable to reflect the light with specific colors and/or broad silvery whitish colors. These reflecting platelets play a fundamental role of camouflage by effectively reflecting the light from upward in the environment such as in clear oceanic water or in turbid rivers. It is interesting to underline that, compared with those in insects and birds; the extremely different point in fish is represented from the color-producing structures, dynamically maintained in living systems.
This situation causes various interesting physiological change in structure and hence in colorcast as well as the extremely thin guanine crystal platelets play an important role in motile activity in fish coloring.
On the interesting **Chapters 7** and **8** the problems regarding colors of *Plants* and *Miscellaneous* are respectively reported as topics. Plants also, as beetles, birds and fish have lamellar structures in the outer portion of the epidermal cell wall of leaves causing sophisticated interactions with the light. This is the reason why some plants in the deep shade of Malaysian rain forests display blue or green iridescence.
On one hand, the green color of leaf is necessary to capture the appropriate light energy necessary for the photosynthesis, so that the green iridescence is originated from the convex nature of the outer wall of the epidermal cell, which plays a role of micro lens necessary to focus the incident light to the chloroplasts.
On the other hand, the blue iridescence is considered to come from thin-film interference at the leaf surface. However, these microstructures may function as a spectral enhancement of the flower color, also if they may have other unsuspected functions unknown till now.
Miscellaneous comprise shells, spiders and other marine animals offering interesting topics on structural colorations.
The stratified plates in pearl and mother-of-pearl, for example, are known as thin single crystal of aragonite cemented by organic materials called *conchiolin*. These layers are stratified one another to strengthen the body like a brick wall, so that the structural colors in mother-of-pearl are conflicting among diffraction grating, multilayer interference an the combination of both. As a consequence, the intensity profile of the reflected light is strongly affected by the surface condition, whether it is as grown, polished, or cracked, while the shell will display green/purple two-color iridescence more vividly than that which was found in rock dove. On the other hand, comb-jellyfishes are known to have eight rows of comb-plates running radically on the body. These combs, composed of numerous locomotory cilia, fantastically reflect iridescent light when the fish are swimming also.
Colors in nature, present in the land and in the sky through the different species of animals and plants, evidence the beauty of our planet that we try to imitate by the fabrications of cosmetics and textiles.

This book underlining the fundamental optical properties of the structural colors which distinguish the biological diversity of animals and plants, and evidencing the physical basis of the phenomena governing the color of selected lepidopterans, beetles, birds, fishes, and plants, may be of great help for scientists involved in the fields of cosmetics, textiles, glass, food, pharmaceuticals and different other goods, as well as for marketing managers and students of the chemical and medical communities who should like to understand in a deeper way the fascinating and growing sector of natural colors.

P. Morganti
Editor-in-Chief

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Quarterly Review of Cosmetic Dermatology

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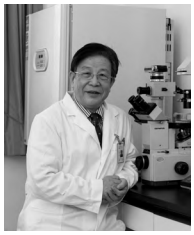

International Society of Cosmetic Dermatology Application & Research

To members and friends

Dear Colleagues,

The International Society of Cosmetic Dermatology (ISCD) is the first non-profit society of cosmetic dermatology. It was founded in 1982 in Rome and has a scientific history of long run. Its official journal (Journal of Applied Cosmetology) started its first issue in 1983. As you may see on our website (www.iscd.it) the Society has organized 11 international congresses, together with many other regional meetings, held in various locations among both eastern and western countries around the world. These meetings were actively participated by distinguished dermatologists and biologists, such as P. Agache, H. Amamatsu, A.V. Benedetto, J.P. Bentley, R.N. Butler, HD. Chen, A.C. DeGroot, DT Dowing, F.J.G. Ebling, XH. Gao, BA Gilchrest, E. Handog, S. Jablonska, C. Jacobson, A. Jarret, S. Kang, F.H. Kemper, A.M. Kligman, N. Konnikov, S.H. Lee, H. Lim, T. Lotti, H.I. Maibach, P. Morganti, W. Montagna, C.E. Orfanos, J.P. Ortonne, T.J. RyanJ, S. Strauss, A. Tosti, E.J. Van Scott, J. Wepierre, W. Westerhof, J. Uitto and many other scientists worldwide known for their papers and discoveries.

The future program of ISCD would focus on not only cosmetic dermatology itself but also other disciplines involved in the progress of cosmetic dermatology such as biology, physiology, histopathology, chemistry as well as the multidisciplinary biomaterial science, which involves bioengineering chemistry, clinical medicine, regulatory affairs, bioethics, business administration and commercialization transition.

From this year, you are all welcome to read papers published from the 32 years of activities free of charge on our website (www.iscd.it), with an exclusion of those published in the last two years, which reserved for the members and the subscribers only. We hope you could pay attention to our journal and welcome you to submit papers to it.

The 11th International Congress of Cosmetic Dermatology held in Beijing in 2014 with more than 1,500 participants was a great success. The next Congress will be held in Jakarta, Indonesia from September 17th to 18th, 2016. The motto of the Congress is "New Horizon in Cosmetic Dermatology". We warmly welcome you to come and join this event. You may contact Dr. Abraham Arimuko (arimuko@gmail.com) if you are interested in this Congress. We would be very happy if you could disseminate this information to your friends.

Best Regards,

Chen, Hong-duo

Hong-Duo Chen
President ISCD

Pierfrancesco Morganti
Secretary General ISCD

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Adhesion and Arrest of Skin Microbes as Reason for Efficacy of a Pimple Cure Cream Paste (PCCP) – A Siddha Drug

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Summary

Pimple Cure Cream Paste (PCCP)* was evaluated for its efficacy in controlling acne form eruptions (pimple) both by in vitro and in-use methods. The formulation contains the key herbal ingredients viz., *Aloe vera and Ocimum basilicum*, known for their activities.

Result after single application of PCCP in facial skin and neck regions and vole forearms have shown the reduction in the abundance of key indicator colonies of Staphylococcus epidermidis. The re-colonization time of the organism was noted to be 8 hr.

In order to ensure the fact that the activity is due to the adhesion of the drug on the skin. The treated and non treated areas were irradiated b UV, reading the erythema by the use of Mexameter.

The PCCP was applied in the volar forearm region of the skin, allowed to dry for 10 minutes and then the skin region was washed gently. The treated and non treated regions of the skin were exposed to sun for 15 minutes using a window patch made of light impermeable cloth. The findings show that the erythema readings were significantly lower in PCCP applied regions when compared to the control site. The findings confirm that even after washing, the drug shows remarkable residency (bioavailability) on the skin and thereby offers sun protection.

Patients with type 1 and type 2 acne seeking medical advice, were given the drug (as prescription) and were instructed to use the above for a period of 6 weeks. Each patient was reviewed weekly.

The findings of the study clearly show that in 3-4 week use of PCCP, the pimples were reduced. Besides controlling acne eruptions, also provided glow and improvement to the skin tone. This might be due to the possible sun protection effect coupled with moisturizing and skin lightening effects of the actives. The findings are discussed in the paper.

* *Trade name: Evefresh Pimple Cure Cream Paste by Siddha Drug of Dr. JRK's Siddha Research and Pharmaceuticals Pvt., Ltd., Chennai*

Riassunto

Con questo studio, si è voluta valutare l'efficacia di una crema denominata PCCP (Pimple Cure Cream Paste), controllando in vitro ed in vivo la capacità di controllare le eruzioni proprie dell'acne. La crema conteneva come principi attivi gli ingredienti presenti nell'Aloe vera e nell' Ocimum basilicum.

Dopo una singola applicazione effettuata sul viso e sul dorso di pazienti volontari, è stata subito verificata una notevole riduzione della presenza di colonie di stafilococco epidermidis, mentre la ricolonizzazione del microbo si è avuta dopo 8 ore. La crema PCCP sulle zone interne del braccio è stata lavata dopo 10 minuti prima di esporla per 15 minuti al sole utilizzando un patch spesso dotato di una fessura aperta. L'eritema solare controllato con il Mexameter dopo il lavaggio, è risultato significativamente meno intenso nell'area trattata rispetto all'area della zone di controllo, a dimostrazione dell'aderenza di PCCP sulla cute.

Ai pazienti affetti da acne di tipo 1 e 2 che hanno chiesto consigli medici, è stata prescritta PCCP da applicare per 6 settimane sulle aree da trattare.

Il prodotto ha dimostrato di ridurre le eruzioni acneiche, migliorando sia il tono che l'idratazione cutanea soprattutto quando il trattamento con la crema PCCP veniva preceduto dalla crema 2 ad attività detergente. I risultati ottenuti sono discussi in questo lavoro.

INTRODUCTION

Acne (pimple) is a sebaceous gland disorder that occurs due to multi various causes. This disease being one of the most common skin problems of people of the adolescent age group (2), affects the cosmetic appeal of the sufferer, and the confidence and self-esteem as well (1). Factors such as excessive sebum, anxiety, stress, excessive exposure to sun light, intake of high fat and sugar rich diet and poor personal hygiene are known to contribute to the problem of acne (3, 4).

The clinical manifestations of acne vary from mild form like comedons (white heads and black heads) to pustular form while the gram positive anaerobic bacteria-*Propionibacterium acnes* is its principal cause (5). The other manifestations of acnes are nodular and nodulocystic forms which are resistant to treatment (6).

Several treatment options are available for acne. The treatment options vary from mild cleansers to exfoliating agents, such as keratinolytic, antimicrobial, sebum controlling, retinoid agents etc (7). Use of hormone therapy is also available.

An effective drug for acne therapy should not only control acne progression, but also minimize the post acne scars, hyper-pigmentation, excessive sebum and the other likely predisposing factors. However, such an effective drug is far from sight, as on date.

Staphylococcus epidermidis, ubiquitous in human skin, is the gram positive, coagulase negative bacteria, known to play also a role in acne form eruption.

The present study evaluated the efficacy of PCCP in reducing the microbial burden of *Staphylococcus epidermidis*. To know its anti-microbial effect, the rate of re-colonization time and the sun protection effect as proof of its skin adhesion has been verified as well as its clinical efficacy against type-1 and type -2 acne. The sun protection effect of PCCP has been evaluated by Mexameter. The findings are presented in the paper.

MATERIALS AND METHODS

Study on the skin adhesion of PCCP as a proof of microbial limit

Three regions of the skin were chosen viz., face, neck and volar forearm. The users of PCCP were selected for the study after their obtained written consent A fingertip unit (2 mg/cm^2) of PCCP was applied in the pre-selected areas of the skin in all the three regions and was allowed to dry for 15 minutes. After drying, the skin was gently cleaned with distilled water and the skin was allowed to dry.

Swab sampling was TAKEN from the treated regions of the skin and plated onto Baird Parker agar supplemented with egg yolk tellurite emulsion (8). The plates were incubated at 26 °C for 3 days. The number of colony forming units (CFUs) of *Staphylococcus epidermidis* was counted. The sampling was done from the treated skin regions after 30 minutes, 2 hrs, 4 hrs, 6 hrs and 8 hrs.

Similarly sampling was TAKEN from non-treated skin regions either washed with distilled water or with toilet soap at the specified time intervals mentioned above.

The CFU's of *Staphylococcus epidermidis* in treated and untreated skin sites at different time intervals were compared. The effect of washing either with distilled water or toilet soap in removing the bacteria and its re-colonization times was also ascertained.

Water resistance as a proof for sun protection – Mexameter based study

To control the effective adhesion and water resistance of PCCP, the erythema index in the skin exposed regions to sun was measured by using Mexameter (9).

In the volar forearm region, 2 mg of PCCP was

applied evenly on 2 cm^2 areas. After 15 minutes, the skin area was washed with distilled water. Then the cm^2 area of the skin was exposed to sun for 15 minutes by using window patch made by a thick black sun impermeable cloth. Similarly the control site, without application of PCCP was also exposed to sun by the same method.

The erythema reading was taken using Mexameter. The erythema value of the skin before and after cream application, exposed to sun was read and compared. Similarly the erythema value of the control skin (without use of PCCP) before and after exposure to sun was compared.

To reconfirm the water resistance effect, various concentrations of PCCP viz., 5 mg, 10 mg, 15 mg were tested

In-use evaluation of efficacy of PCCP by acne sufferers

The PCCP, being a registered Siddha proprietary drug, is available for prescription to clinicians. Twenty patients with type-1 and type-2 acne were provided with PCCP freely, requesting to give their feedback on the efficacy. All the patients were requested not to use concomitant medication with antibiotics. Further all patients were ensured to follow the compliance norm strictly. The total duration of study was 4 weeks with weekly reviews.

Written feedback forms were given to the volunteers asking them to rate the efficacy of PCCP over a period of use of 4 weeks. Various organoleptic and other associated benefits were also collected.

Combination treatment approach of PCCP and Cream 2

The combination of PCCP pre-wash and post use of cream 2 was also studied to understand the combination or synergistic effect of both the drugs. Cream 2 is also a registered proprietary Siddha drug available to the clinicians for prescription.

Composition of PCCP		**Composition of Cream 2**	
Aloe vera	0.2%	*Aloe vera*	2.0%
Ocimum basilicum	2.0%	*Curcuma zeodaria*	0.2%
Cream paste base	Q.S	Cream base	Q.S

RESULT

Study on the skin adhesion of PCCP as a proof of microbial limit

Significant reduction in the microbial COUNT of *S. epidermidis* was observed in PCCP applied skin regions. The reduction of microbe COUNT after 30 minutes was noted to be in two digits from their respective initial load of TNTC. 8 hours was the re-colonization time. The combination of PCCP and Cream 2 was found to be superior over monotherapy with PCCP- (Table I and II).

TABLE I

ABUNDANCE OF *Staph.epidermidis* IN THE SKIN AFTER THE SINGLE APPLICATION OF PCCP

No	Anatomical sites		Load of *Staph.epidermidis* in the skin after the application of PCCP in CFU's				
			30mins after use	2 hrs after use	4 hrs after use	6 hrs after use	8 hrs after use
1	**Untreated**	Volar forearm	TNTC	TNTC	TNTC	TNTC	TNTC
		Neck					
		Face					
2	**Treated**	Volar forearm	61	109	164	227	317
		Neck	84	137	205	284	363
		Face	55	105	149	213	250

No. of colonies obtained from the anatomical sites before the application of cream was could not in countable range and hence considered as TNTC (Too Numerous To Count)

TABLE II

ABUNDANCE OF *Staph.epidermidis* IN THE SKIN AFTER THE SINGLE APPLICATION OF PCCP WITH CREAM 2

No	Anatomical sites		Load of *Staph.epidermidis* in the skin after the application of PCCP + Cream 2 in CFU's				
			30mins after use	2 hrs after use	4 hrs after use	6 hrs after use	8 hrs after use
1	**Untreated**	Volar forearm	TNTC	TNTC	TNTC	TNTC	TNTC
		Neck					
		Face					
2	**Treated**	Volar forearm	39	75	134	183	264
		Neck	55	101	155	232	309
		Face	28	72	108	154	213

No. of colonies obtained from the anatomical sites before the application of cream was could not in countable range and hence considered as TNTC (Too Numerous To Count)

Water resistance as a proof for sun protection – Mexameter based study

After exposure to sun for 15 minutes, significant increase in erythema formation was observed in control skin region (Table III).

The cumulative % difference in erythema value found decreased with increased dose of PCCP from 5mg/cm^2 to 15mg/cm^2. The effect of PCCP post wash in reducing erythema formation, suggests a strong adhesion of PCCP on skin. Such adhesion seems due to water resistance property of PCCP so that a reduction in sun induced erythema was trecovered (Table III).

However, the skin appeared dry when the PCCP was used twice daily continuously for 5 days. Hence the combination of PCCP along with cream 2 was studied.

Findings of the study show that the combination therapy was marginally better than single therapy with PCCP. The mean reduction in erythema after combination therapy was 7.2 (Table IV) compared to 4.7 for single therapy with PCCP.

In-use evaluation of efficacy of PCCP on acne affected subjects

Eighteen out of twenty volunteers responded well to 4 week treatment. Complete remission of the symptoms and near complete remission of the post inflammatory scars, reduction of superficial sebum, etc., were observed in all patients by 4th week (Table V).

TABLE III

REDUCTION IN ERYTHEMA VALUE AFTER USE OF PCCP

Volunteer	Control			5 mg			10 mg			15 mg		
	Before	After	% diff	Before	After	% diff	Before	After	% diff	Before	After	% diff
1	481	500	-4	450	449	0	456	451	1	432	429	1
2	400	420	-5	360	342	5	399	381	5	366	341	7
3	388	388	0	370	366	1	390	381	2	351	348	1
4	442	468	-6	488	451	8	481	419	15	456	444	3
5	463	487	-5	394	390	1	412	402	2	390	378	3
6	490	501	-2	488	469	4	456	413	10	490	473	3
7	466	475	-2	470	434	8	449	445	1	469	452	4
8	309	390	-26	484	429	11	389	378	3	412	400	3
9	390	412	-6	415	445	-7	411	403	2	432	339	22
10	435	465	-7	469	460	2	447	440	2	470	475	-1
11	445	480	-8	475	469	1	477	465	3	517	500	3
12	425	454	-7	457	440	4	429	418	3	468	460	2
13	459	480	-5	429	424	1	442	435	2	430	400	7
14	429	449	-5	459	445	3	460	450	2	475	480	-1
15	491	502	-2	501	479	4	471	455	3	492	480	2
16	513	540	-5	526	500	5	523	502	4	499	480	4
17	371	404	-9	412	400	3	399	380	5	394	375	5
18	424	450	-6	342	340	1	346	324	6	359	328	9
19	462	499	-8	498	480	4	430	428	0	461	400	13
Sum	8283	8764	-117	8487	8212	58	8267	7970	71	8363	7982	88
Average	435.9	461	-6.2	446.7	432	**3.1**	435.1	419	**3.7**	440.2	420	**4.7**

TABLE IV

REDUCTION IN ERYTHEMA VALUE POST USE OF PCCP AND CREAM 2

Volunteer	Control			5 mg			10 mg			15 mg		
	Before	After	% diff	Before	After	% diff	Before	After	% diff	Before	After	% diff
1	515	523	-2	487	473	3	458	438	4	465	409	12
2	382	374	2	357	367	-3	338	330	2	429	398	7
3	354	370	-5	366	371	-1	372	334	10	438	425	3
4	461	477	-3	425	399	6	461	429	7	476	388	18
5	414	432	-4	426	418	2	464	437	6	445	398	11
6	360	390	-8	452	387	14	434	406	6	444	420	5
7	487	522	-7	501	451	10	487	435	11	476	454	5
8	306	348	-14	353	344	3	301	300	0	343	290	15
9	401	420	-5	396	394	1	380	360	5	378	364	4
10	451	476	-6	511	476	7	536	525	2	517	500	3
11	411	420	-2	450	396	12	402	375	7	492	495	-1
12	446	471	-6	467	431	8	469	460	2	520	510	2
13	463	465	0	422	421	0	406	404	0	451	419	7
14	406	446	-10	449	397	12	450	393	15	469	405	14
15	657	676	-3	679	721	-6	615	684	-10	692	695	0
16	358	377	-5	397	390	2	347	334	4	404	360	11
17	306	385	-26	371	360	3	384	350	10	403	310	23
18	389	416	-7	406	387	5	407	401	1	429	400	7
19	539	576	-7	489	480	2	513	464	11	475	516	-9
Sum	8106	8564	-117	8404	8063	77	8224	7859	94	8746	8156	138
Average	427	450	-6.2	442.3	424.4	**4.1**	432.8	413.6	**5**	460.3	429.3	**7.2**

TABLE V

RESPONSE OF ACNE TO COMBINATION THERAPY OF PCCP AND CREAM 2

Pretreatment status	No of patients	During treatment															
		Week 1				Week 2				Week 3				Week 4			
		P	M	G	E	P	M	G	E	P	M	G	E	P	M	G	E
Comedones	8	-	--	7	-	-	-	8	-	-	-	-	8	-	-	-	8
Pustular	10	-	3	4	3	-	-	7	3	-	-	-	10	-	-	-	10
Nodulocystic	2	2	-	-	-	2	-	-	-	-	2	-	-	-	2	-	-

P = Poor – Remission less than 10%
M = Moderate – Remission less than 25%
G = Good – Remission up to 50%
E = Excellent – Remission above 75%

DISCUSSION

The predisposing factors of acne vary from host associated factors to climatic factors, the food habits and the pathogen related aspects. The production and secretion of sebum, the underlying hormonal imbalances, excessive sun exposure, in- take of fat and sugar rich diet are some of the other predisposing factors of acne (10). Although virulence of the microbe that is involved in the acne formation do worsen the clinical manifestation, the infected persons are not seems to be infective to others in the population. This suggests beyond doubt, the role of host associated factors than the role of pathogen.

During pathogenesis of acne, the sebaceous duct and the gland are infected by anaerobic commensal flora of the skin- Propionibacterium acnes (8). As a result of the inflammatory response, an outward invagination of the skin tissues occurs. Acne with active inflammatory responses (comedones and pustular acne) are relatively easy to treat (1).

Due to the complex nature of etio-pathology of acne, the treatment approach has to be multi directional, targeting more than one etiology of the disease. In the conventional line of treatment, most of the anti-acne preparations are antimicrobial in nature. Keratinolytic agents like salicylic acid is also used widely for treating acne (7).

After understanding the complexities involved in the treatment of acne we made a formulation with multi-targeted activity such as anti- microbial effect, exfoliating effect, sebum controlling effect, sun protection effect, skin lightening and scar removing effect.

In order to understand the adhesion of PCCP over the skin, two separate experiments were conducted viz., reduction in microbial presence and re-colonization time as well as the water resistance test. Immediately within 30 minutes of application of PCCP, the microbial load was decreased to countable limit from its initial load of TNTC (Too numerous to count). Further it took 8 hours for the microbes to re-colonize over

the treated skin.

To confirm that only the adhesion of PCCP has resulted in the above effect, we have evaluated the skin adhesion mechanism of PCCP by subjecting it to water resistance test. 15 minutes after application of PCCP. The skin it washed was selectively exposed to sun irradiation. The reading of the sun induced erythema was controlled by Mexameter. The reduction of the erythema intensity of the treated skin compared to the control may be due to its sun protection effect. Such an effect of the cream after its wash strongly suggests its adhesion over the skin. This was further reconfirmed by the reduced level of erythema reading vis-à-vis the dose of PCCP.

The clinical efficacy of PCCP has revealed that in 18 out of 20 patients, remarkable reduction in the acne form eruptions was noticed by 3 to 4 week of treatment. This suggests the PCCP effectiveness. Further significant reduction in the visibility of acne scars, sebum formation, improvement in skin tone etc., were also observed in all patients.

Since PCCP was reported to cause skin dryness by some patients, we explored combination therapy over single drug therapy. Cream 2 was applied post use of PCCP. We found that the effect of PCCP was only augmented by the post use of cream 2. Further it was shown that both the reduction in microbial abundance and sun protection effect were enhanced by the use of cream 2. The clinical findings in small group of patients also proved the above fact in the combination therapy with the additional benefit of moisturization. The findings of the study clearly show that PCCP formulated with *Ocimum basilicum and Aloe* vera (11) seems to be effective, multi- directional anti acne preparation with multiple target specificity. In any way, it should be necessary to better control its activity on *Propionibacterium acnes* also.

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20 Golden Rules to Select the 'Perfect' Raw Material Supplier

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Summary

The selection of a reliable supplier of ingredients is a key step in the R&D and market life of any cosmetic product. Selection criteria for a trustworthy cooperation relationship, usually lasting many years, are seldom clearly shared between the participants. Moreover, they are related to many peculiar company elements. Indeed, some sides of the supply relation should be well thought in the selection phase.
First of all, the completeness of scientific and commercial information, the fast availability to supply samples and to give answers to questions concerning substances. The detailed quality of ingredients should be clearly identified, without forgetting impurities and by-products. Then, the ready cooperation concerning the supply and storage details, while the relative nearness to the stocks is another important selection factor. Previous positive company relationships have also their weight, as the specific experience of the supplier in the application field of the involved substances.
Quality certifications, together with inspective checks of the supplier facilities by means of suitable visits on site, are additional selection elements. Without forgetting the economy sides of commercial contacts, as time and payment conditions.

Riassunto

La scelta di un fornitore affidabile di ingredienti cosmetici è un passo importante nelle fasi di sviluppo formulativo e della vita di mercato di ogni prodotto cosmetico. I criteri di selezione per un rapporto affidabile di collaborazione, che deve poi durare alcuni anni, sono di rado chiaramente espressi. Inoltre dipendono da molti fattori aziendali specifici. Tuttavia, alcuni aspetti del rapporto di fornitura dovrebbero essere ben presenti nella fase di selezione. Innanzitutto, la completezza della documentazione scientifica e informativa, la disponibilità alla fornitura di campioni e al soddisfacimento delle richieste relative alla letteratura sulle sostanze.
La qualità degli ingredienti deve essere circostanziata in modo trasparente, senza dimenticare impurezze e sottoprodotti. Poi, la pronta collaborazione relativa a modalità di consegna e formati maneggevoli per magazzino e produzione. La prossimità aziendale del luogo di deposito/fabbricazione è un altro fattore importante.

Esistono poi elementi storici come la fornitura di altri ingredienti. L'esperienza dimostrata dal fornitore nel campo di applicazione specifico delle sostanze è un altro fattore chiave. La certificazione di qualità e la qualificazione dell'azienda mediante visita ispettiva da parte del cliente sono elementi aggiuntivi importanti. Senza dimenticare la qualità degli aspetti economici del contratto commerciale (tempi, pagamenti, sconti).

INTRODUCTION

Since the beginning of alchemic investigation, it was clear that many possibility existed to adequately illustrate chemical ingredients and their properties in order to catch the attention of potential customers. Leonardo Fioravanti, Venetian, in his 'Compendio de i Secreti Rationali' VENEZIA 1654, was writing : 'I write to demonstrate the huge force and nobility of the chemical art, except in two things that I never dared to make: to create gold and silver. So, no wonder if I will not describe that, but I will write for you many recipes to prepare such things (meaning: pharmaceutically functional wonders)'.

THE UNIVERSE OF COSMETIC INGREDIENTS

The modern formulator of cosmetic is faced with a universe of ingredients to handle, all belonging to very many different functional categories and possessing a large variety of physical, chemical and sensorial properties. Surfactants, emollients, rheology modifiers, conditioning agents, emulsifiers, film formers, humectants, colors & pigments and solvents, just to mention a few ones. Indeed, when he is faced with the need of appropriate selection and quantification to assemble a functional formula , the professional task of formulator looks very hard. From vaguely expressed, ideal concepts of perceptions, functionality & guaranteed safety the formulator has to select and develop precise ratios among not always well-defined ingredients. He needs to behave like 'the master of ingredients' in order to obtain a satisfactory combination of them, able to fulfill all the project's goals. This is the most complicate working strategy in the art of formulation.

Formulation, a wicked problem

The arrangements of ingredients that make a complete cosmetics formula constitute really 'wicked' systems, were causes & effects are elusive, just like solving traffic problems in a big city (fig. 1). In all these cases, there is not just one (perfect) solution for one specific problem. On the contrary, a wide range of possibilities contemporarily exists, each one of them being only partially correct and only partially satisfying. Moreover, not only the individual ingredients, their detailed composition and properties, may create selection troubles. Frequently, just their position in the formula, their changing behavior as time goes by, their background in the company history, and even their names create appeal or disregard in the marketing & consumers' mind.

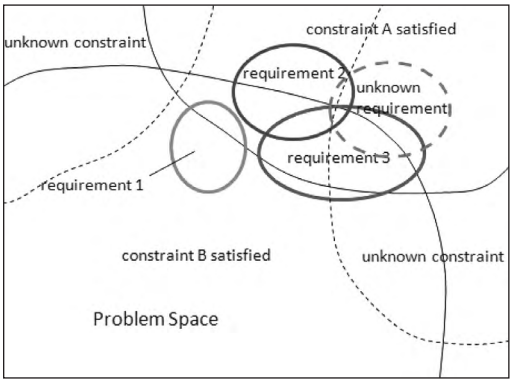

Fig. 1 *Representation of wicked problems, like the formulation process.*

The perfect sales account service

To successfully assist the 'master formulator' in his daily battle with many ingredients, a perfect supporter can be identified in the figure a professionally skilled raw materials representative. Let's have a look to his ideal profile. In general,

he is a fighter: the Latin words 'luctor et emergo' (I will fight and stand out) describe well his behavior. He wants to sell the maximum number of his ingredients, fighting with strong competitors, while enchanting with his words and catching the formulator's interest. Finally, he aims to win the battle of the market. We all know that, in order to satisfy the consumer of cosmetics, many players need to successfully manage their battles every day. Therefore, it is evident that joining their forces is a necessary winning strategy. Indeed, both formulators and sales people share the same objectives. It is necessary to create cooperation, establish professional relationships, that are intended to keep up for years. This expediency is frequently challenged by the hurdles fixed by the respective company strategies. Each one trivially tries to make its own interest The question rise: is a simple communication between the stakeholders really possible ?

Choice & communication clues

But…it seems so simple to find ways of effective cooperation. Frequently, the many detailed questions forwarded by formulators to raw material sale accounts remind the Saint Paul motto 'Don't ask sublime things'. But it is true that the formulator should 'Dare to know', according to the maxim of Horace. The difficulties in this battlefield are a huge amount: in the XV Edition of the International Cosmetic Ingredient Dictionary & Handbook (CTFA 2014) there are 21.000 monographs, 68.000 commercial names offered by an array of 3.000 raw materials manufacturers, belonging to 100 nations. It is well known that interactions among partially known ingredients, having partially certified functionality, performing skin/hair interactions which can only partially be foreseen, could create a nightmare when their blends need to be investigated. This task deserves strong allies, like a battle in a troubled landscape. Indeed, our 'master of ingredients' is faced with many constraints, and selection limits. Specially today, in a society dominated by the 'NATURAL, ORGANIC or NATURAL DERIVED' issues. The new today question could be : are really quantitative, non-ideological, formulation projects belonging to old times?

Formula project at a glance

Formula Project requires the identification and quantification of a number of technological definitions: performances, product characteristics, safety profile, stability behavior, physical form, costs. And also the acquisition of detailed marketing and commercial elements: communication, market evaluation, innovation aspects. Plus the application of the art of creativity and the assembly of an array of sensorial performances. Identification and quantification of all these elements is exactly the formulation game. One has to consider that the basic reasons of raw materials adoption in cosmetics formulae can be grouped within three main domains: technology, innovation, and communication.

a) Technology

Basically, as far as technology is concerned, in the field of raw materials choice this term means: Clear, complete specification, definition of starting raw materials, knowledge of impurities and by–products. The formulator needs exhaustive safety information, a good set of scientific literature and self-explanatory application examples. The performances/costs balance, the easy availability of the material when the moment of the industrial production of the formula will arrive, the national and international distribution network are key element for a good choice. The ease of getting abundant samples together with the degree of confidence with the supplier/retailer, are quality elements that can adequately support quality based competition. During routine buying cycles, availability of several standard container sizes, batch data tran-

sparency and homogeneity of production characteristics are really necessary. Constant conformity to agreed specifications and fast supply speed are positive items

b) Innovation

When considering the innovation characteristics of raw materials, it is well known that the characterizing elements of the ingredients could be very many. For instance, they could be following new trends or even anticipating future trends. But it could also happen to find out the possible 'wonder uses' of already well known ingredients. Battle against miscommunication is at the same time necessary, in order to avoid dangerous fairy tales, that work only in the short term.

All this is not enough! The formulator chooses also on the basis of scientifically demonstrated cutaneous functionality, ingredient's origin, obtained 'organic' certifications, easy compatibility with the other formula ingredients, synergy effects on specific product characteristics and ease of handling during manufacture.

c) Communication

All marketing claims (new, natural, technological) made possible by a new ingredients are also winning elements. Providing the marketing to communication hooks bound to the 'new ingredient' is a tool for general accord in the company between R&D and marketing people. Ingredients that have as only characteristic the communication to the final consumer should be clearly identified. Their choice should be objectively determined and shared with other functions in the company, as it is not really technically or innovation driven.

Customer Service - Care

There are some additional details that may influence the formulator decision: the nearness to the warehouse or production site, the previous supply of other ingredients to the company. Frequently, the supplier's specific experience in certain raw materials application fields may address the choice. In such case, the supplier provides valuable support to R&D department and can largely help in the problem solving strategy. It is evident that customer care requires initial assiduity, in the form of samples, e-mail, interesting news etc., but, on the whole, the formulator should receive the impression of being thought, and not pressed!!!

As Time goes by…

The time variable has also its importance in the raw materials adoption process. Unexpected, disappointing late communications like 'Sorry, it is not produced anymore' should have been addressed well in advance. Moreover, fair communication with the customers is necessary. The perfect salesman should never ask: how much do you pay for it ? or, worse, say : mine is better. On the other side, the formulator should keep adequately secret the commercial side of the sales man competitors.

Sensorial Enchantment

In order to make the salesman and formulator contact more fruitful, the sales agent should try and organize simple sensory games. One has to remember that sensory evaluation is frequently the key client's evaluation! With this method, colors, odor, flow, stickiness, greasiness elements of the new ingredient can be easily shared and memorized.

CONCLUSION

To conclude, the perfect sales relationship should foresee the creation of a 'system constellation' around the ingredients, where their tridimensional image could show-off. For instance, the reports of presentation at scientific congresses , the comprehensive literature, the presence

in worldwide recognized raw materials lists. Also examples of already marketed applications could stimulate the formulator fantasy, especially when the provided examples belong to a famous star company. Ethics will always be awarded! Suppliers should avoid to bet on the shortage of analytical controls taking place today in some companies. Picturing an honest image of the ingredient is always the best key to a continuous sales success!

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Nanostructures and Nanomaterials. Synthesis, Properties, and Applications

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Nanomaterials and Nanostructures attract tremendous attention worldwide in recent research fields, including physics, chemists, material scientists and mechanical and electrical engineers. Nanotechnology referees to the development of devices, structures, and systems whose size varies from 1 to 100 nanometers (nm).

The term *nano, originated* from the Greek with the meaning of dwarf, indicates physical dimensions that are in the range of one-billionth of a meter. Thus, one nm is approximately the length of two hydrogen atoms and 1000 nm is the mean dimension of a bacterium. Nanoscale structures permit the control of fundamental properties of materials without changing the materials chemical status, requiring knowledge drawn from a variety of scientific and engineering arenas.

This is why; designing at the nanoscale is working in a world where physics, chemistry, electrical and mechanical engineering, and even biology become unified into an integrated field. Thus, all the products are manufactured from atoms and their properties depend on how those atoms are arranged. For all these reasons, nanomaterials often have properties dramatically different from their bulk-scale counterparts.

The goal of nanotechnology is to close the size gap between the smallest fabricated structures and chemically synthesized large molecules.

The aim of this book, organized by 9 chapters and appendices, is “to summarize the fundamentals and technical approaches in synthesis, fabrication, and processing of nanostructures and nanomaterials has to provide the readers with a systematic and coherent picture of the field".

After the **Chapter 1**, introducing the attractive application of nanostructures in the practice of medicine referred to nano medicine, **Chapter 2** focuses on the *Physical Chemistry of Solid Surfaces*. Nanostructures and Nanomaterials, in fact, possess a large fraction of surface atoms per unit volume, so that the surface energy increases with the overall surface area, depending on the dimension of the material also. Due to the huge surface area, all these nanostructured materials possess a huge surface energy and, therefore, are thermodynamically unstable. Thus, the necessity to know and understanding the mechanisms governing surface energy and surface physical chemistry of solids and, of course, of all the nanomaterials, before starting their fabrication and processing.

Two are the approaches for the synthesis of nanomaterials and the fabrication of nanostructures: top-down and bottom-up, all both reported on **Chapter 3** *Zero-Dimensional Nanostructures: Nanoparticles*.

Attrition or milling is a typical top-down method in making nanoparticles, whereas the colloidal dispersion is a good example of the bottom-up approach. The bottom-up, referring to the approach to build a material up from the bottom (atom-by-atom, molecular-by-molecular, or cluster-by-cluster), promises a better chance to obtain nanostructures with less defects, while the biggest problem with the top-down approach is the imperfection of the surface structure.

In this chapter, the attention has been focused mainly on the synthesis of nanoparticles through thermodynamically equilibrium approach, including single crystal, polycrystalline and amorphous particles with all possible morphologies, such as spheres, cubes, and platelets. However, for any practical application, the processing conditions need to be controlled in such a way that resulting nanoparticles have the following characteristics: (a) identical size and uniform distribution of all the particles; (b) identical shape and morphology; (3) identical chemical composition and crystal structure; (c) individually dispersed or mono dispersed with no agglomeration.

Spontaneous growth and template-based synthesis are considered as a bottom-up approach, whereas lithography is a top-down technique.

Spontaneous growth, process driven by the reduction of Gibbs free energy, results in the formation of single crystal nanowires or nanorods along a preferential crystal growth direction depending on the crystal structures and surface properties of the nanowire materials. In this process, for given material and growth conditions, defects and impurities on the growth surfaces can play a significant role in determining the morphology of the final products.

Template-based synthesis mostly produces polycrystalline or even amorphous materials. This the topic discussed on **Chapter 4** *One-Dimension Nanostructures: Nanowires and Nanorods*, where the fundamental and principles of the major synthesis methods to produce nanowires, nanorods, and nano tubules of various materials, including metals, semiconductors, polymers, and insulating oxides are reported.

The synthesis methods reported is limited to the more common fundamentals and concepts techniques used. Among them the electrospinning technique is reported and discussed. This technique uses electrical forces to produce polymer fibers with nanometer-scale diameters. Polymer nanofibers obtained via electrospinning have found wide applications in optics, microelectronics, protective clothing, drug and cosmetic release, and advanced medications. Electrospinning occurs when the electrical forces, at the surface of a polymer solution or melt, overcome the surface tension and cause an electrically charged jet to be ejected. When the jet dries or solidifies, an electrically charged fiber remains. This charged fiber can be directed or accelerated by electrical forces and then collected in sheets or other geometrical forms. The morphology of the obtained fibers depends on the process parameters, including solution concentration, applied electrical field strength, and the feeding rate of the precursor solution.

These nanofibers have some unique properties: they are highly porous, i.e., they have a large interconnected void volume in the range of 50% or even greater than 90% and possess a very high surface-to-volume ratio, making them fibrous scaffolds useful for many biomedical and industrial applications.

In any way electrospinning is not only an effective method to prepare nanofibers, but it is also a convenient technique to incorporate other nanomaterials such as nanoparticles into nanofibers. Moreover, this innovative technique can also be utilized to synthesize core-shell nanostructures that

have potential applications in biomedical areas such as protective labeled biomedical ingredients and delivering the drug in a sustained way.

Two-Dimensional Nanostructures: Thin Films is the subject focused on **Chapter 5** where the fundamentals and the typical experimental techniques used for film deposition are reported.

Film growth can be divided into two groups: vapor phase deposition and liquid-based growth. The former includes for example, evaporation, chemical vapor deposition (CVD), molecular beam epitaxy (MBE), and atomic layer deposition (ALD), while examples of latter are electrochemical deposition, chemical solution deposition (CSD), and Langmuir-Blodgett films and self-assembled mono layers (SAMs). However, film deposition involves heterogeneous processes, such as evaporation, adsorption and desorption on growth surfaces, and heterogeneous nucleation and surface growth, on the substrate also, generally carried out in a vacuum.

In practice, the integration between film and substrate plays a very important role in determining the initial nucleation and the film growth, as well as the deep knowledge of the vacuum science, amply discussed into the book.

In biomedicine the self-assembly method is considered of great importance for the synthesis of thin films to be used, for example, as advanced medications. By this method, nanostructured materials can be assembled (organic or inorganic-organic) into ordered macro scale structures, such as thin films.

Self-assembly is a generic term used to describe a process that induces the arrangement of molecules and small components under the influence of chemical reactions, electrostatic attraction, and capillary forces. At this purpose, it is to remember how the concept of self-assembly derives from observing that, in natural biological processes, molecules self-assemble to create complex structures with nanoscale precision. Examples are the formation of the DNA double helix or the formation of the membrane cell from phospholipids.

These processes, which self-assemble and organize sub-units into well defined structures, are guided by information coded into the same sub-units capable to form the final structure with the lowest free energy. External factor, such as change in temperature, or change in pH, can disrupt this natural organization, as well as the self-assembling nanostructures created by the nano-technological approach to make new materials. However, the self-assembly technology is limited to the fabrication of organic or inorganic hybrid thin films, while both MBE and ALD offer the most precise control of deposition at the single atomic level with the best quality.

Special Nanomaterials is the topic discussed on **Chapter 6**. Carbon is a unique material that can be a good metallic conductor in the form of graphite, a wide band gap semiconductor in the form of diamond, or a polymer when reacted with hydrogen.

The different property of graphite and diamond are a consequence of the different way the carbon atoms in the materials are bonded. Thus, graphite is soft, light, flexible, and conduct electricity, while diamond is extremely strong, hard and does not conduct electricity. Both materials are made of atoms of carbon linked through strong binding, but in graphite each carbon atom uses three out of its four electrons to form single bonds with its neighbors, forming a linear sheet, whereas in diamonds each carbon atom uses all its electrons to form four single bonds, resulting in a 3-D structure.

This chapter describes two new forms of carbon that do not exist in nature: fullerene and nanotube. The former is an allotrope of carbon formed of 60 atoms of carbons linked together through single

covalent bonds arranged in a highly symmetrical closed shell that resembles a football. The latter appears as a rolled-up tubular shell of graphene sheet, which is made of benzene-type hexagonal rings of carbon atoms. Thus, the body of the tubular shell is mainly made of hexagonal rings of carbon atoms whereas the ends are capped by half-dome shaped half-fullerene molecules. All both these structure, bringing unique physical properties have great potential in numerous promising fields, such as *materials and manufacturing* (replacing heavy metals, produce innovative polymers and sensors,etc); *environment and energy* (solar converters, groundwater treatment, membranes for cleaning gases,etc); *electronics and computers* (transistors, fibers and displays,nano fabrication of chip,etc); *space, aircraft and transportation* (replacing metallic components, micro fuel cell technology, filtering gases,etc).

Nanostructures Fabricated by Physical Techniques is the topic reported on **Chapter 7**, focused mainly on the top-down fabrication of nanoscale structures with different processing techniques, derived from the industrial experience of the microstructures. Various techniques are discussed such as lithography and nanolithography. Also if these technologies have the capability of a mass production, until now they results in surfaces damages that impact the performance of the resultant nanostructures and nano devices.

One of the critical challenges faced by the researches in the nanotechnology and nanoscience fields remains the lack of instruments to observe, measure, and manipulate the materials at the nanometer level. Characterization and manipulation of individual nanostructures requires not only the extreme sensitivity and accuracy, but also the atomic level resolution.

For this reason, the development of novel tools and instruments is one of the greatest challenges in the nanotechnology. This is the topic reported on **Chapter 8** *Characterization and Properties of Nanomaterials, where* the fundamentals and basic principles of the characterization methods for controlling the usual chemicals are used for nanomaterials also. Among them X-ray diffraction (XRD), scanning electron microscopy (SEM), transmission microscopy (TEM), and scanning probe microscopy (SPM), are focused and discussed. However new methods have to be recovered in the next future because the size effects on mechanical properties of bulk nanostructured materials is far more complicated, since there are other mechanisms involved, such as grain boundary phase and stresses.

In conclusion, nanotechnology offers a broad range of potential applications from electronics, optical communications, and biological systems to new materials, opening new exiting challenges. Thus, in nanomedicine the major challenge is *miniaturization*, such as the fabrication of new instruments capable to analyze the human tissues at molecular level, or the production of *sensors* smaller than a cell, or the possibility to make nano devices so small to have the capacity to enter into the blood stream for controlling tissues and organs or neutralizing chemical toxins.

These so called nanobots have the potential to serve as vehicle for delivering therapeutic agents, detecting early diseases, or repairing metabolic or genetic defects. The goal of these innovative machines could be that of releasing a drug in a designed area, minimizing its potential side effects, or binding a particular active ingredient to an assigned target for preventing a virus to infect a cell. These and others the possibilities that innovative materials and devices may have in the next future. This the final fascinating topic developed by the final **Chapter 9** *Applications of Nanomaterials*.

The authors ends the book affirming that "nanotechnology, penetrating into every aspects of our life, will make the world different from what know now", especially when it is possible to demonstrate its value over the existing legacy systems.

So the main issues of adoption, for example, of new technologies in the medical field must tap into the value stream to be candidates for adoption. Thus, the benefits of time and cost reduction, together with the improved capability to determine what these values are and how we can demonstrate them, must be analyzed in advance.

This interesting book, useful as general introduction to people just entering the field of nanomaterials and nanotechnologies, may be of interest of the experts seeking for information in other subfields, such as material and biomedical engineers, clinical medical doctors, molecular cell biologists, hystologists, as well as experts of bioethics, regulatory affairs, business administration and commercialization, but also students of the chemical and medical communities having an interest on nanoscience.

P.Morganti
Editor-in-Chief

Defects and Damage in Composite Materials & Structures

by Rikard Benton Heslehurst

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The concept of self-assembly derives from observing that, in natural biological processes, molecules self-assemble to create complex structures with nanoscale precision. For example a protein, guided by information content into the DNA, self-assembles in a specific structure with the lowest free energy consume.

By similar mechanisms it is possible to create new materials as polymers, block copolymers and nanocomposite materials made by the use of natural or man-made compounds. Thus, nanocomposite is a conventional material reinforced by nanoscale particles or nanostructures which are dispersed through the bulk material (matrix).

The idea is to use building blocks with dimensions in the nanometer range for creating new materials with unprecedented flexibility and improvements in their physical properties, mimicking the hierarchical composition of the human *bone*.

Nanostructured fibrous materials, or *nanofibers*, are another important class of Nanomaterials now available thanks to recent development in electrospinning and related fabrication technologies. The geometry and degree of order of all these structures depend on the concentration and the volume ratio between the polymers and/or components used to form, for example, sandwich-like membranes.

Advanced composite materials refer to those fiber/resin composite systems that have greater strength and stiffness properties over conventional glass fiber material. These new composite materials provide many significant advantages over conventional metal used in structures applications, as well as possess some distinct attributes. The fibers and matrix remain, in fact, individual constituents. Moreover, while the fibers provide the strength and stiffness of the composite, the matrix protects the brittle fibers, providing load transfer between adjacent fibers.

In any way, the basic premise of the term *composite material* is that the combination of different materials to form a new material is done in such a way that each constituent material does not lose its individual form or property. It is, however, to remember that the right freedom design gives composite materials their greatest advantages and uniqueness, providing an increase in the damage tolerance and toughness of the final product.

This the topics discussed on the **Chapter 1,** as *Introduction* of the book which, composed of **6 chapters** focused in the fiber-reinforced types of composite materials, provides a detailed description of defects and damages associated with these advanced materials and structures.

Defects and damage in structural components are common occurrences, whether they arise during material *processing*, component *fabrication*, or in-service *action*.

Chapter 2, *Damage and Defect Description*, reviews all the known defect and damage types in composite structures, reporting an amply discussion on their location and occurrence found in different categories and realized products with interesting explicative tables. At this purpose, in fact, different defects have been grouped into specific categories arising during the life of the composite structure, reporting their relative size, location or origin within the composite structure, and evidencing also the effects of known stress states in some composite components.

In-service components, for example, may reveal defects occurring through mechanical actions or contact with an hostile environment, such as local, overloading, heating, chemical attack, UV radiation etc. In conclusion every possible damage has been reported evidencing the relevance of its identification and the modality to repair it.

Chapter 3, *Finding the Nonconformity*, is focused on the nondestructive inspection (NDI) methods employed in the repair process of composite and bonded structures. The first and most important activity in a repair process is, in fact, to identify the defect/damage. Thus the necessity to localize and evaluate the type, size, shape and internal position of the damage before the possibility of its repair. At this purpose, the in-use different NDI methods, such as visual, acoustic, ultrasonic, thermography, interferometry, radiography, and microwave are reported, explained and amply discussed by different sections.

It is mandatory that the successful application of any NDI method depends on its right selection as well as the availability of personnel with the required skills, so that equipment and facilities, trained operators and comparative specimens are of fundamental importance.

Chapter 4, *Failure Mechanisms*, covers the various failure modes and mechanisms associated with composite materials and structures leading to the final loss of performance.

Advanced polymeric composite materials, in fact, are prone to a large number of defects and damage types, such as fiber failure, transverse matrix failure, interfacial failure,and delaminations, all emanating from the constituent material processes, composite component manufacture,and in-service use of the composite component. Thus, many failure mechanisms of the generalized defects and damages are reported and discussed with a reported description of their relationships to their load type and orientation, enriched with different explicative tables.

Chapter 5, *Loss of Integrity*, covers the current state of our understanding of the defects more serious in terms of structural integrity found in composite structures, i.e. intralaminar matrix cracks, interlaminar matrix cracks, and fiber holes.

The generalized representation of all the defects are reported on very clear tables and figures,while their influencing factors are amply reported and discussed to give a clear idea to a non-expert lecturer also.

Once the damage of a defect has been identified and evaluated, a repair scheme has to be developed, reviewing all the possible and successful damage/repair requirements. And this is the topic of the **Chapter 6**, *Restitution and Repair*, where the development of generic repair types in composite structures are reported and discussed.

The restitution of a defect or damage, in fact, requires a good appreciation of its severity to determine the best and more efficient repair design for the composite structure to be restored. If defects/damages are found, the needs to be designed for repair have to be recovered. In addition, fol-

lowing restitution of the defect/damage, an inspection of the repaired area is highly recommended by the use of the different NDI post-repair methods. All these different topics are amply described on this chapter also by the use of tables and figures/photos.

This interesting book, enriched with many bibliographic references, represents a quick basic, and consultive source for all scientists, chemists, engineering and technicians, who, involved in the studies of composite materials like know and better understand the different defects and damages that may associated with composite materials and related structures.

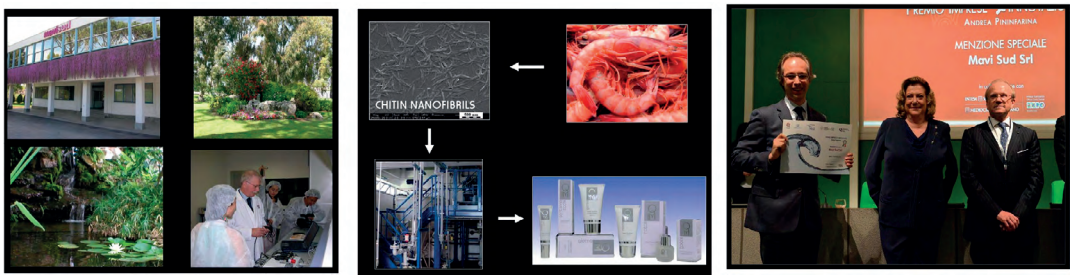
Written from an author with a high experience in the field of in-service activities for composite airframe maintenance and repair, it may be a basis of study for students of the chemical and engineer communities who wish to enter in the fascinating field of polymers and composite materials to be used not only in the aerospace industrial field, but in other sectors, such as pharmaceutical, food and cosmetic.

P. Morganti
Editor-in-Chief

MAVI RECEIVED THE AWARD FOR EXCELLENCE MADE IN ITALY "ANDREA PININFARINA"2014

In our times marked out by a system and a banking policy that do not support the small medium enterprises constituting the Italian industrial *fabric*, there are still some enterprises leaded by strong willing entrepreneurs that innovate following the guidelines of the ***bio-economy*** or ***green economy***.
In this area, the idea of innovation is closely related to the production of goods and services based on the decreased consumption of water and energy, and on the increased use of renewable raw materials extracted from plant and animal biomass.
At present, we use only 25% of the total annual 300 million tons of biomass production.

MAVI is an Italian SME founded in 1987, which operates in the cosmetics sector. It manufactures ***clinically correct cosmetics***, formulated into its own R&D laboratories, certified by national and international universities and hospitals.
Dedicated to the safeguard of skin and environment, MAVI recently improved the effectiveness of its cosmetics by the use of the internationally patented ***chitin nanofibrils***, a natural sugar-like ingredient extracted from fish waste, with extraordinary features.



From the left: *MAVI environment; from crustaceans' waste the innovative MAVI cosmetics; MAVI Financial Manager, Dr. G. Morganti, receives the award "Andrea Pininfarina" from Confindustria Vice-President, D.ssa D. Bracco and Confindustria President, Dr. G. Squinzi.*

Entered into a selected **European Research Network**, MAVI proved how chitin nanofibrils can be a real help for a ***green innovation*** in different industrial fields: ***advanced medications, packaging, and agriculture.***

On November in Turin, MAVI has been officially prized with the **"Award for Excellence Andrea Pininfarina 2014"** as one of the 20 Italian enterprises with the best innovation performance.

We are proud to be part of Italy that innovates!

Marketing Office
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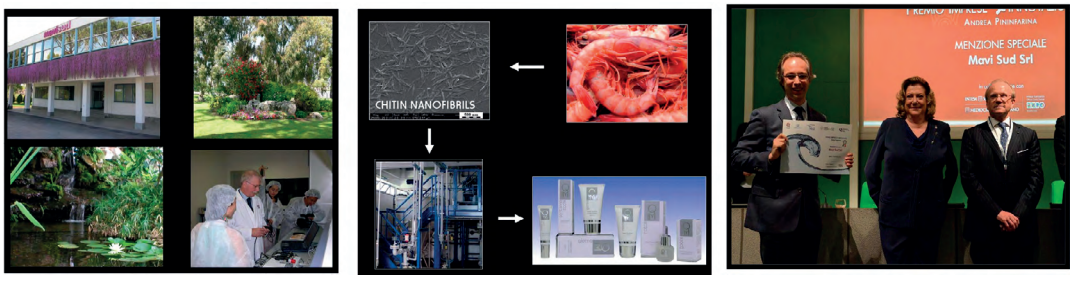
MAVI VINCE IL PREMIO PER L'INNOVAZIONE MADE IN ITALY "ANDREA PININFARINA"2014

In un periodo storico caratterizzato da un sistema bancario e di governo che non supporta il micro tessuto industriale tipicamente italiano, c'è ancora una nutrita schiera di aziende che, guidate da imprenditori visionari, si batte per innovare secondo le linee guida della ***bio-economia*** o ***green economy***, ove il concetto di ***innovazione*** è strettamente legato alla produzione di beni e servizi frutto di un ridotto consumo di acqua ed energia e di un aumentato uso di materie prime di recupero dalla biomassa vegetale ed animale. Attualmente, di questa biomassa di scarto pari a 300 miliardi di tonnellate annue, viene utilizzato soltanto il 25%.

MAVI è una PMI italiana che da circa 30 anni produce ***cosmetici clinicamente corretti***, frutto di studi condotti nei propri laboratori di ricerca, validati da università e centri ospedalieri nazionali ed internazionali. Sensibile a temi quali la salvaguardia della cute e dell'ambiente, di recente ha rivoluzionato le formulazioni dei prodotti grazie alla scoperta delle straordinarie benefiche proprietà insite nelle ***nanofibrille di chitina***, ingrediente naturale ricavato dagli scarti della lavorazione dei crostacei, di cui detiene brevetto internazionale.



Da sinistra: *la realtà MAVI; dagli scarti dei crostacei ai cosmetici innovativi; il Direttore Amministrativo di MAVI, Dr. G. Morganti, riceve il premio "Andrea Pininfarina" dalla Vice Presidente di Confindustria, D.ssa D. Bracco e dal Presidente, Dr. G. Squinzi.*

Entrata a far parte di un ristretto network di ricerca dell'Unione Europea, MAVI è riuscita, inoltre, a dimostrare come con l'uso delle *nanofibrille di chitina* esista la concreta possibilità di sostenere una ***green innovation*** anche in altri settori: ***medicazioni avanzate, packaging e agricoltura.***

Il 17 novembre, con cerimonia ufficiale tenutasi presso la sede dell'Unione Industriali di Torino, MAVI è stata una delle 20 imprese italiane premiate con il prestigioso riconoscimento **"Imprese per l'Innovazione Andrea Pininfarina 2014"**.

Siamo orgogliosi di far parte dell'Italia che innova!

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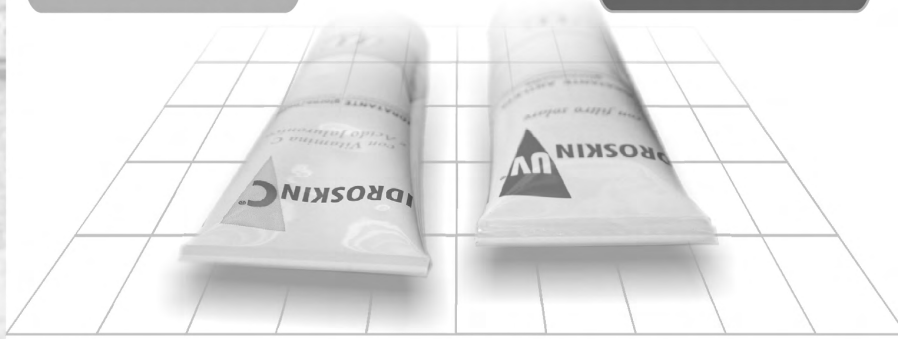

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In copertina / Front cover

Elettrofilatura di Nanofibrille di Chitina (CN).
Foto al microscopio elettronico a scansione (SEM). Su gentile concessione del CNIS, Centro di ricerca per le Nanotecnologie applicate all'Ingegneria della Sapienza, Università La Sapienza, Roma - Italia

Electrospinning of Chitin Nanofibrils (CN).
Scanning Electron Microscopy (SEM) micrographs. On kind permission of CNIS, Research Center on Nanotechnology Applied to Engineering of Sapienza University, apienza University of Rome - Italy

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